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Original Articles.

METHODS FOR TESTING DONORS FOR TRANSFUSION OF BLOOD AND CONSIDERATION OF FACTORS INFLUENCING AGGLUTINATION AND HEMOLYSIS.

BY GEORGE R. MINOT,* M.D., BOSTON.

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BLOOD transfusion in recent years has become a common therapeutic procedure. Untoward results have been relatively few, even when donors were not selected by tests to avoid agglutination or hemolysis. Bad results have been more frequent perhaps when the patient was suffering with an obscure blood disease, than an acute secondary anemia. At one time it was thought that all untoward results were hemolytic or agglutinative, and could thus be eliminated if the recipient's blood caused no hemolysis or agglutination of the donor's, or *vice versa*. We now know that even after excluding the possibility of a hemolytic or agglutinative reaction, and excluding accidents such as loosening thrombi, introduction of too much blood, etc., that may follow transfusion, other reactions of unknown nature sometimes occur and more usually in patients with high fever, sepsis, or blood disease than in those with a secondary anemia. At present we have no means of determining when these reactions of unknown nature will occur.

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It is, however, well recognized that it is desirable to select for transfusion a donor, who is not only healthy and whose blood gives a negative Wassermann reaction, but whose plasma neither hemolyzes nor agglutinates the patient's red cells and whose cells are not hemolyzed or agglutinated by the patient's plasma. Moss,[1] Bernheim[2] and Ottenberg and Kaliski[3,4] among others, have shown that the result of such reactions *in vitro* can be definitely taken as reliable evidence of what may happen *in vivo*, so far as hemolysis and agglutination are concerned. In order to determine if a donor is suitable we should have as simple and rapid a method as possible, to test blood for its power to agglutinate or hemolyze other blood. A consideration of methods for doing this and the action of the human hemolysins and agglutinins, will form the basis of this paper.

THE ISO-AGGLUTININS AND ISOHEMOLYSINS IN HUMAN BLOOD.

A hemolytic or agglutinative reaction occurring from transfusion of human blood is considered to be caused by the normal isohemolysins or iso-agglutinins;* and not to those caused by heterologous agglutinins or hemolysins, such as occur when blood of one species is transfused to another, or to immune agglutinins or hemolysins when blood containing these is involved in the transfusion.

* The prefix iso is used to designate that variety of agglutinin or hemolysin, which is effective against the red cells of another animal of the same species. Iso-agglutinins or isohemolysins may be normal; *i.e.*, occurring naturally, or immune, resulting from injection of red cells of one animal into another of the same species. The isohemolysin is of a complement-amboceptor nature.

Moss,[5] especially, has shown that iso-agglutination frequently occurs without isohemolysis, but isohemolysis is always associated with iso-agglutination or preceded by it. Therefore, if one tests a serum or a plasma for its ability to agglutinate† red cells and it does so, it may or may not hemolyze them, but if there is no agglutination there will be no hemolysis.

It has been shown that all adult human beings can be divided into four distinct groups§[5,6] in regard to the ability of their red blood corpuscles to be agglutinated by other human sera or their sera to agglutinate other human red cells; it being generally considered that there is no auto-agglutination. Thus if two individuals belong to the same group, neither will agglutinate or hemolyze each other's red cells. Some of these groups are rarer than others, and the frequency of the different groups as given by Moss[5] is similar to our experience.§

The group to which an individual belongs is an inherited characteristic which follows Mendel's[9,10] law; an individual always remaining in the same group regardless of disease.[5,7]

However, v. Decastello and Sturli[22] and Langer[21] have shown that in children under six months of age the iso-agglutinins in the serum may not be demonstrable, though the agglutinability of the red cells by the different sera is usually developed, but not always. Moss‡ and Happ have shown that the group characteristic is established in the corpuscles before it is in the serum. They have also shown that the group may be established at birth, and that it is completely established in about 85% of children between one and two years of age, though it may not be established until ten years of age or more.

It should be noted that Ottenberg, Kaliski and Friedman[8] have pointed out that if one transfuses agglutinable cells, the recipient may develop immune iso-agglutinins and would thus perhaps change the grouping to which he belongs.

It is stated that auto-agglutination may occur in the very rare condition acquired hemolytic jaundice, Hayem-Widal type. Some believe that auto-agglutination may sometimes occur in pernicious anemia, malaria and other diseases, though never normally, but the more recent authorities who have studied many cases consider that there is no auto-agglutination, with which I agree. Whether such an auto-agglutinin, if it actually ever does occur, can be differentiated from the normal iso-agglutinins is not known, but this phemomenon should be thought of and not lead to confusion when the tests mentioned below are done. Rarely, and then only in pathological conditions, so that they do not affect the choice of a donor, autohemolysins occur which are distinct from and not to be confused with isohemolysins. Such autohemolysins occur in paroxysmal hemoglobinuria.[7] In some cases of toxemia there occurs an autohemolysin, perhaps of a chemical nature. Such an instance is reported by Moss[5] in a case of uremia, and I have seen the same in a mildly uremic patient. A patient whose blood contained such an hemolysin, though belonging to the same group as the donor, might be able to hemolyze the donor's cells, but probably no more so than his own.

† In this paper agglutination and hemolysis refer to the normal iso-agglutination and iso-hemolysis, unless stated to the contrary.

§ Moss[5-7] characterizes the groups as follows:
Group I. Serum agglutinates no corpuscles. Corpuscles agglutinated by sera of groups II, III and IV.
Group II. Serum agglutinates corpuscles of groups I and III. Corpuscles agglutinated by sera of groups III and IV.
Group III. Serum agglutinates corpuscles of groups I and II. Corpuscles agglutinated by sera of groups II and IV.
Group IV. Serum agglutinates corpuscles of groups I, II and III. Corpuscles agglutinated by no sera.
About 85% of all individuals belong to groups II and IV. Jansky[6] also divided individuals into these four groups, but his group I corresponds to Moss' group IV and *vice versa*. Ottenberg refers to Jansky's numbering of groups and not Moss'. In this paper I refer to Moss' numbering of groups.

‡ Personal communication.

USE OF GROUPS TO TEST DONORS.

The more usual method for testing donors for transfusion is to test directly the patient's serum or plasma against the donor's cells and *vice versa*. If no agglutination or hemolysis occurs *in vitro*, there will be no agglutination or hemolysis *in vivo*, and the two individuals must belong to the same group, though which group is not known.

The fact that all adult individuals belong to one of four possible groups so far as their agglutinins and hemolysins are concerned is of practical importance because one may determine the group to which a patient belongs, and then use as a donor one belonging to the same group as the patient. This enables one to test at different times and places donors and recipients without having to test directly the patient's blood against each prospective donor. For example, at the Massachusetts General Hospital we have determined the group to which a series of individuals belong who are willing to act as donors. When one wishes to transfuse a patient, his group is determined and a donor belonging to the same group is summoned and the transfusion may then be done without further tests and without fear of any agglutinative or hemolytic reaction taking place in the patient. Likewise as soon as a patient enters the hospital his group is determined if it is likely that he will be recommended for transfusion. Later, the group to which his friends belong is determined if their general health is such that they are suitable for donors. Then a friend belonging to the same group as the patient is used as a donor.

In view of the fact that the group to which an individual belongs may not be fully developed in children, one cannot always use this group method to test their blood, and in such instances the blood should be tested directly against the donor's. However, if the child's blood shows that it belongs to a definite group, which it is more apt to do if the child's corpuscles are used than serum, one may then of course use the group method.

Moss[5,7] has shown that in order to determine the group to which an individual belongs, when his group is fully developed, it is only necessary to test the agglutinative action of his serum against the red cells of two certain known groups (groups II and III) or to test his red cells for their agglutinability by the serum of these same two groups.‖ If we test the patient's serum, we must have on hand individuals belonging to groups II and III, so that they may furnish a drop of blood to be used as a red cell suspension in the tests described below. Such a suspension will keep for about 48 hours. However, if one tests the cells from the patient, (a drop sufficing for the test), one must have on hand sera of the groups II and III, which if kept sterile will remain perfectly active for months, and requiring but two small drops for each test. It requires but 20 minutes to perform the tests as described below.‡

METHODS TO TEST ISO-AGGLUTINATION, USING SERUM AND CELLS.

It is desirable to have as simple and rapid a method as possible to test the iso-agglutinative action of the blood, there being no need to test the hemolytic, because hemolysis never occurs without agglutination, and even if there is no hemolysis of the patient's or donor's cells with each other's serum, agglutination itself is undesirable.

The methods for testing for iso-agglutination and hemolysis described by Moss,[13] Epstein and Ottenberg,[11] and Weil[12] (method with citrated plasma) involve either one or more of the following undesirable features: large amounts of blood: a long time to do the tests, even over three hours; washing of red cells, and special glassware.

Moss' Method.

Of these tests, Moss'[13] microscopic method seems the best, being the simplest and quickest. It may be used for testing to what group a patient belongs, or to test a donor's and patient's blood directly against each other. The test consists simply of mixing one drop of serum with one drop of an approximately one per cent. suspension of twice washed red cells, and observing microscopically whether agglutination takes place or not. The greatest objection to the technic for a simple test is that it necessitates washing the red cells.

‖ This is because the cells of each of the four groups act differently in regard to their agglutinability by the serum of groups II and III; and the serum of each of the four groups has a different effect as to whether it causes agglutination or not of the cells of groups II and III.

‡ Dr. Vincent has called to my attention that one may determine to what group a patient belongs (using both his cells and serum) if one has on hand serum and cells of only group II or group III. One may see how this is possible by referring to the characteristics of the different groups. For example: If an individual's cells agglutinate with group II serum, he belongs to group I or III. If group II cells are agglutinated by the individual's serum, he must belong to group III or IV. Previously we learned that the individual could belong to group I or III only, therefore, he cannot belong to group IV and must belong to III. Similarly it may be worked out for the other groups.

Simplification of Moss' Method.

However, I have found that the test may be perfectly satisfactorily done without washing these cells, the red cell suspension resulting from collecting a drop of blood in approximately one c.c. of a solution of 1.5% citrate in .9% salt solution being entirely satisfactory. Rous and Turner[14] have recently shown that a small amount of citrate interferes in no way with agglutination and I have found the same, though with excessive amounts, over 7%, the agglutinative action of serum is weakened.

Though it is necessary only to test the individual's cells against the serum of the groups II and III, or the individual's serum against the cells of these two groups in order to determine the group to which he belongs; or to test reciprocally the cells and sera of patient and donor to determine if they belong to the same group; it is perhaps desirable to have controls of each individual's own cells and serum. Should rouleaux-formation of the red cells (see below) only occur and be mistaken for agglutination, it will occur in the controls as well as in the test specimens, for the ability of a serum to form rouleaux is not affected by the cells of the different groups or individuals. Likewise, should any auto-agglutination occur, it would be demonstrated.

Technic of the Microscopic Agglutination Test.

The technic of doing this microscopical agglutination test is simple. Thoroughly mix a drop of serum with a drop of red cell suspension and look microscopically for agglutination. It is preferable to use a hanging drop, though the two drops mixed on an ordinary slide with a coverglass over them is perfectly satisfactory provided that one remixes the cells and serum after 5 and 10 minutes by lifting the coverglass.

If agglutination is going to take place it will do so usually in a very few minutes, but it is, as pointed out by others, desirable to wait 15 or 20 minutes before deciding definitely that there is no agglutination. In some instances one may see the agglutinated masses macroscopically, but one cannot depend on this method for macroscopic readings. Sometimes besides seeing the agglutinated red cells, one will see hemolysis taking place. The appearance of the agglutinated red cells is quite characteristic. They appear in balled-up masses, clumped together in no regular order; sometimes all the cells are agglutinated into a few large clumps, or if the agglutinin is weaker, as many small clumps. Often one may be able to hasten the agglutination by tilting the slide or remixing the drop of cells and serum. Such procedures often allow larger agglutinated masses to appear.

The glassware used in doing the test must be clean, but not necessarily sterile. One must be careful not to handle the different sera or cell suspensions with the same pipette without very thorough washing.

Rouleaux Not to be Confused with Agglutination.

One must be careful to differentiate agglutination from rouleaux-formation of the red cells, *i.e.*, when red cells are piled on top of one another in an orderly fashion, like a pile of coins. In some instances rouleaux-formation may be very marked and appear, if hastily looked at, much like agglutination, but when examined more closely can be easily differentiated. Remixing the serum and cells will tend to break up rouleaux masses, while it tends to cause more agglutinated masses. Both rouleaux and agglutination may, of course, occur in the same preparation.

Sellards[15] has pointed out that serum which has stood over 24 hours loses its power to form rouleaux; in rare instances I have seen a serum retain this property for three days. Thus, if one is using old serum for the agglutination test, rouleaux will not occur. Sellards has shown that this property of serum is greatly augmented by heating to 60° C. for one-half hour and by concentration of the serum; and that slight dilution causes this property of serum to be lost. Increasing the percentage of cells to serum increases the amount of rouleaux-formation.

In the agglutination test described above by diluting the serum equally with the approximately 1% red cells suspension, it usually prevents any rouleaux occurring, both because of the dilution and because of the small number of cells present.

Serum which has shown very active rouleaux-forming power has been obtained from two cardiac cases with marked broken compensation, and perhaps was due to a concentration of these patients' sera. If rouleaux-formation is marked, it appears macroscopically much like agglutination.

Methods of Obtaining Serum.

If one has serum previously collected, there will be no delay in determining the results of the tests, but if one must wait for serum to separate from the clot, there will be some delay. Should a centrifugalizing machine be at hand, there will be but little delay, for by centrifugalizing a previously loosened blood clot, serum will be quickly separated. If no centrifuge is at hand, serum can often be obtained in less than 30 minutes by collecting blood in a capillary pipette, separating the clot after it has formed from the sides of the glass, and waiting for serum to collect in the lower sealed-off end of the pipette. This procedure involves special glassware and care, for it is apt to result in stirring red cells into the separating serum.

I have found the following method useful to obtain serum quickly or when it can be obtained in but small amounts. Allow two drops of blood to dry on a glass slide, preferably concave, or a bit of concave tin such as is used for Widal's test. The dried blood is then redissolved in its own volume of water, being careful to get it thoroughly into solution. This solution may then be used as serum. The presence of free hemoglobin does not interfere in any way with agglutination nor will strands of fibrin be mistaken for agglutinated masses of red cells. One cannot lake blood directly with water and use satisfactorily the resulting solution for serum, because, to prevent clotting taking place, it requires greater dilution than is desirable for the test. Such a solution can, however, be used to test for the bacterial agglutinins, as shown by Von Liebermann and Acél[16], because they are active in much greater dilution than the iso-agglutinins.

Methods for Testing Iso-agglutination with Citrated Plasmas.

(*A*) *Rous and Turner's Method.* Rous and Turner[14] have recently described a method for testing iso-agglutination, using mixtures of citrated blood, which is applicable to testing donor and patient, but is not entirely satisfactory to determine to which group an individual belongs. This method consists of making two and, if desired, three mixtures of citrated plasma, which are examined microscopically for agglutination. Blood is collected separately from the patient and donor in white counting pipettes, being diluted as it is drawn, with citrate solution, so that the resulting mixture contains about 1% of citrate. From these citrated specimens of blood, mixtures are made by means of capillary pipettes, as follows:

1. 9 parts of patient's citrated plasma with 1 of donor's.
2. 1 part of patient's citrated plasma with 1 of donor's.
3. 1 part of patient's with 9 of donor's (if desired).

After the mixtures have stood for about 15 minutes, a drop is placed on a slide and examined microscopically to see if agglutination has occurred or not. Though not necessary, it is desirable to add a drop of salt solution to the drop from the mixture, before looking for agglutination, so that the red cells appear more separated and one can see the agglutinated masses more easily.

If there is no clumping in the mixtures, the two bloods do not agglutinate, and will not hemolyze each other. If clumping occurs in the first mixture, and to a less degree in the second mixture, it is certain that the blood of the patient agglutinates, and may, perhaps, hemolyze the donor's. Clumping in the second mixture, with little or none in the first, indicates that the plasma of the patient agglutinates the cells of the recipient. Rous and Turner feel that, for practical purposes, the first two mixtures suffice, but if there is a desire to know if both bloods contain agglutinins, the third mixture should be made. If the first and the third mixtures show large clumps and the clumps are smaller

in the second mixture, two agglutinins must be present. Should there be only one agglutinin, little clumping, or none, will be observed when the blood containing the agglutinin is diluted with the nine parts of the other blood.

The reason that this test is not satisfactory for determining to which group an individual belongs is because of the possible presence of two agglutinins in one mixture. Though one, with care, may tell to which group an individual belongs by using citrated plasmas, it is apt to be confusing. Likewise, it would mean hunting up at the time of each test, individuals belonging to groups II and III.

This test is simple and may be done quickly, but the great difficulty is that the blood is apt to clot in the collecting pipettes. It also requires capillary pipettes to make the mixtures. The presence of non-agglutinable red cells, in the proportions in which they occur in the mixtures, does not interfere with being able to see the agglutinated masses. However, the clumps appear smaller than when simply cells and serum are mixed together.

(*B*) *Modification of Rous and Turner's Method.* I have found that this test may be performed without the need of accurately diluting the blood by white counters, so that the disturbing factor of clotting is done away with. One may get quick and satisfactory results by performing the test as follows:

Place 3 to 4 drops of a 1.5% citrate solution in .9% salt solution in a short (about 2 cm.) test tube, with a relatively large diameter (about 1 cm.); then collect in this tube 9 drops of blood from the recipient and one from the donor, and in another tube similarly collect 9 drops from the patient and one from the recipient. I prefer to use only these two dilutions, though one may also use a dilution of 1 drop from each individual, using two drops of citrate solution. The drops of blood are collected from a prick in the ear, trying to allow the blood to fall directly into the citrate, but it makes no difference even if the blood runs down the side of the glass. One does not need to have the drops exactly the same size, and the amount of blood does not need to be accurate, but approximate, the reason for which will be explained later. After the mixtures have been mixed by shaking, and have stood for about 15 minutes, one then takes out a drop and examines it microscopically for agglutination, as described above.

There is no reason why the citrated plasma cannot be collected separately by the above method, and the mixtures made from these, in which case one may have as a control, if one desires, the citrated plasma of each case.

SUMMARY.

One may determine in 20 minutes, at the longest, the group to which an adult patient belongs, if he has on hand serum (which retains its agglutinating power for months) of groups II and III, by simply mixing separately one small drop of each serum with a small drop of a suspension of red cells from the patient (obtained by collecting one drop of blood in about 1 c.c. of a 1.5% of citrate solution in .9% salt solution), and observing microscopically the presence or absence of agglutination in the two preparations after 15 or 20 minutes.

If, instead of serum, one has on hand corpuscle suspensions, of the two groups, II and III (requiring but a drop of blood in about 1 c.c. of the citrate solution for each suspension), one determines the group to which the patient belongs, according to the presence or absence of agglutination in the two preparations, made by mixing a small drop of his serum with a small drop from each of the two known red cell suspensions.

In children the group may not be established. If the group is not established, a direct test between donor's and patient's blood should be made.

If it is desired to test directly the agglutinability, and thus the possible hemolytic action, between the blood of the patient and of the donor, the simplest and quickest method, requiring at the most, slightly over 20 minutes, is the method described above, requiring approximate amounts of citrated blood, not over ten drops from each individual, collected directly into a tube containing citrate solution.

Controls of each patient's serum and cells, or his own plasma and cells, are not strictly necessary, but desirable if one is not accustomed to doing the test, or thinks auto-agglutination may occur.

By using the methods described above, one can determine in 20 minutes if a donor is suitable; this short time is desirable, as transfusion is often an emergency operation.

Likewise, the test may be done with very little blood, which is convenient when blood is difficult to obtain.

The tests require no special apparatus,—a needle, test tubes, citrate solution, anything to pick up a drop of serum and cells with, glass slides and cover glasses, and a microscope are all that are required.

Factors Preventing Agglutination and Hemolysis and Consideration of Type of Donor That is Able to Cause the Severest Agglutinative or Hemolytic Reaction.

It is desirable to point out certain phenomena about iso-agglutination and isohemolysis that have been emphasized by others, and help explain why bad results do not always occur when transfusion is done between individuals of different groups.

Ottenberg[17-18] states that transfusion of agglutinable blood may produce, but often does not produce, bad results. This is because of three factors,—interference with agglutination by an excess of non-agglutinable cells, absorption of the agglutinin by the agglutinable cells, and concentration of the agglutinin.

Transfusion between members of different groups may not always cause hemolysis, first, because isohemolysins are not always present, occurring in but about 20% of sera that are agglutinative. Secondly, if isohemolysins are present, the effect of an anti-hemolytic substance (which occurs in any blood with cells that can be hemolyzed) is a factor to prevent hemolysis. A third factor is a certain amount of absorption of the hemolysin by the cells that can be hemolyzed. Of course, the concentration of the hemolytic and anti-hemolytic substances and their quantitative relation comes into play in determining whether hemolysis will occur or not. If there is a very strongly hemolytic serum or an insufficient amount of anti-hemolytic serum, or both, hemolysis will probably occur.

It is generally accepted that it is more dangerous to transfuse a patient with agglutinable cells than with agglutinative plasma, because if agglutinative plasma is put into a patient, not only is it diluted, but it meets with an excess of agglutinable cells, which absorb the agglutinin, and thus allow either no clumping to take place, or but a few very small clumps to form. There have been no bad results reported in cases known to have been transfused with this type of plasma. If one cannot obtain a donor whose blood is of the same group as the patient's, one can then use with probable safety a donor whose serum is agglutinative for the patient's red cells. It is, however, wiser not to do this if it can be avoided, and is to be recommended only when a proper donor cannot possibly be found, but is, nevertheless, to be greatly preferred to a donor whose cells are agglutinated by the patient's serum.

When one transfuses agglutinable cells which meet with an excess of agglutinative serum, bad results sometimes occur. It is in such instances that phagocytosis of the foreign red cells by the patient's leucocytes is reported. Even if there are no untoward symptoms in the patient, at least some of the cells transfused, if not all, are agglutinated, and may thus perhaps be hemolyzed. Transfusion of this sort would probably not be as beneficial as if a proper donor was used. In such instances the red cell destruction may act to stimulate the production of new blood by the bone marrow, and in this way aid the patient. This has been pointed out by others, and I have seen a case of Dr. Vincent's respond in this manner.

Moss[13] has pointed out that one is, perhaps, more apt to have bad results when transfusion is done between two individuals each of whose serum is agglutinative to the cells of the other, for in such an instance we have two agglutinative phenomena, and may thus have two hemolytic processes taking place in the body at the same time. This possibility can occur only when transfusion in either direction is done between groups II and III, and fortunately group III is rare.

The protective mechanism against hemolysis is different from that against agglutination, but the donor that is the most dangerous on account of agglutination is, likewise, the most dangerous on account of hemolysis. Again we see that isohemolytic action follows after the agglutinative, recalling that hemolysis does not always occur if agglutination does, but that it never occurs without agglutination. However, a hemolytic reaction in the body is probably more serious than only an agglutinative one.

It has often been shown that plasma belonging to the cells that can be hemolyzed contains an anti-hemolytic substance. Thus when we transfuse hemolytic plasma, not only is it diluted by the recipient's blood, thereby rendering it less active, but it meets with an excess of plasma that has anti-hemolytic properties and an excess of cells able to absorb the hemolysin, so that hemolysis does not take place. When transfusion has been done with this type of plasma no severe reactions have been reported. When the reverse type is used, severe hemolytic reactions have occurred, though not always. Hemolysis, in such instances, may occur, because with the entrance of cells capable of being hemolyzed into the patient's blood, this blood containing an excess of hemolytic plasma, there enters relatively little anti-hemolytic substance, and what does enter becomes diluted in the patient's blood and, therefore, less efficient.

It seems that in the first instance, when hemolytic plasma is transfused, that if there was no anti-hemolytic agent in the recipient, and the hemolysin was very strong, one might get a severer reaction than in the second instance, where hemolysable cells are transfused, because there would be more cells to be hemolyzed. However, in the cases that have been studied, the severest reactions occur in the latter and not in the former instance.

Factors Influencing Agglutination.

(*A*). *Excess of Non-agglutinable Cells.* An excess of non-agglutinable cells[17-19] causes smaller agglutinated masses of red cells, and the presence of a non-agglutinating serum causes smaller clumps to form than when salt solution is present; thus in the body much smaller clumps are formed than *in vitro*, when serum and agglutinating cells are mixed, so that embolism becomes unlikely, even if there should be agglutination.

(*B*) *Absorption of Agglutinin by Agglutinable Cells.* The agglutinin is absorbed by the agglutinable cells before agglutination occurs (Hoekten,[19] Ottenberg[17]), so that if there is an excess of cells they will absorb all the agglutinin, and no agglutination will take place. Ottenberg[17] states that if the proportion of agglutinating sera to agglutinable cells is 1 to 4, no agglutination occurs, as there is only enough agglutinin to be absorbed by the cells, and not

enough left over to produce agglutinated masses. In some instances I think that agglutination will not occur if the proportion is 1 to 1, and perhaps even if 1 to 2. However, it is not infrequent to find that one must have the proportion often 1 to 1 and not infrequently 1 to 3 before the agglutinated masses can be easily seen and identified. The more agglutinable cells there are in proportion to agglutinating serum the smaller the clumps appear. On the contrary, I think some sera may show agglutinating ability when its proportion to agglutinating cells is as little as 1 to 10 and perhaps 1 to 15. Such variation would depend on the ability of cells to absorb agglutinin and the concentration of the agglutinin.

From the above, one may see why in the tests with citrated plasma it is necessary only to have our proportions approximate; we may have at least 4 drops less than 9 of one blood to one of the other, and still not alter the results. One may have, of course, less than 1 drop to 9 and also not alter the results, provided one realizes that the agglutinated masses will be fewer in number. Even if one has but 1/2 drop to 9, there will be enough clumps to be easily seen.

(*C*) *Concentration of the Agglutinin.* The concentration of the iso-agglutinins is generally considered weak as compared to the bacterial agglutinins. There are a few figures in the literature as to their concentration in health and disease. They vary normally, and disease apparently does not affect their concentration. Ottenberg[17] states that they occur in dilutions of 1/20 to 1/30, Landsteiner and Leiner[20] found them in dilutions of 1/20 to 1/100, and Langer[21] in dilutions of less than 1/25. Hoekten[19] found them in greater dilution, but no greater in 3 cases of typhoid, 3 of tuberculosis, 1 of pneumonia, 1 of scarlet fever, and 1 of serum disease, than in 4 normals, but in one case of serum disease the iso-agglutinin was about four times as strong as in any of these other cases.

I have tested in a few instances the strength of the iso-agglutinins, using .5 cc. of various dilutions of serum and .05 c.c. of a 5% suspension of red cells, looking microscopically for agglutination after one hour. I found that normally they may be demonstrated in a dilution of 1/30 to 1/160, usually in a dilution of 1/60 or 1/80. Normally the strength of the agglutinins in the sera of the different groups seems to vary, as has, likewise, been noted by Moss;† that of group IV seems to be the strongest and group III probably the weakest. The cells of the different groups and cells of individuals of the same group are often unequally agglutinated by the same serum.

The strength of the agglutinin in the serum of a few diseased individuals (1 typhoid, 2 pneumonias, 2 nephritis, 1 secondary anemia, 1 arthritis, 2 pernicious anemias, 1 congenital family jaundice) was tested and found not to vary more than in normal people, with one exception. This exception was the case of congenital family jaundice, whose serum showed agglutinability in a dilution of 1/320. It has been suggested by some that the formation of the iso-agglutinins depends on the reabsorption of one's own blood, the constant destruction of which is going on in the body. It was thus thought that perhaps diseases with increased blood destruction, such as pernicious anemia and family jaundice, might have a greater concentration of the iso-agglutinins. This assumption does not seem to be true, for though the case of family jaundice did have a slightly greater concentration than the few other individuals tested, the two cases of pernicious anemia that were tested did not.

† Personal communication.

Factors Influencing Hemolysis.

(*A*) *Concentration of the Hemolysin.* At present I have not had the opportunity to test the concentration of the hemolysin, except in a very few instances. It apparently varies considerably, being demonstrable in one instance in a dilution of 1/5 and in another in a dilution of 1/150. Usually it has been demonstrable in dilutions of 1/10 to 1/20. In an instance where the recipient's serum hemolyzed the donor's cells in the test tube and clinically there was hemolysis taking place in the body, there was not only an extremely weak anti-hemolytic action of the donor's serum, but the hemolysin in the patient's serum was concentrated and demonstrable in the dilution of 1/150.

(*B*) *Absorption of the Hemolysin by the Hemolyzable Cells.* This action of the hemolyzable cells is somewhat similar to the ability of agglutinable cells to absorb agglutinin so that an excess of cells acts in a certain degree to protect against the hemolysin.

(*C*) *Concentration of the Anti-hemolysin.* The strength of the anti-hemolytic substance varies greatly. I have found in some instances that a fifth part of neutral serum contains enough anti-hemolytic substance to prevent completely hemolysis, while 1.5 parts of another neutral serum will barely diminish the amount of hemolysis caused by the same hemolytic serum. Though an anti-hemolysin exists, there is no anti-agglutinative substance, except possibly in some instances an exceedingly weak one.

It seems that perhaps it would be wise to test the anti-hemolytic property of serum, should one have to use a donor of a different group than that to which the patient belonged. A case* transfused by Dr. Vincent belonged to the rare group III. No donor of group III could be obtained, and the cells of several donors were actively hemolyzed by the patient's serum, and their serum was weak in anti-hemolysin. Another donor, though his cells were hemolyzed by the patient's serum, was considered a relatively

* The tests for this case were made by Dr. Robertson and Dr. Lee.

safe donor because of a large amount of anti-hemolytic substance in his serum. Transfusion was done from this donor, without any reaction in the patient. On the contrary, Ottenberg[8] noticed in a dog that, though there was demonstrable in the test tube strong anti-hemolytic action, the same bloods in the body caused severe hemolysis. What happens *in vitro* in regard to anti-hemolytic action should not perhaps always be taken to indicate what may happen *in vivo*.

SUMMARY AND CONCLUSIONS.

A donor for transfusion of blood should be not only healthy, but should belong to the same iso-agglutination group as the recipient.

Simple and quick methods for testing this have been described.

What these tests show *in vitro* can be taken as reliable evidence as to what may happen *in vivo*, so far as agglutination and hemolysis are concerned.

Even when donor and patient belong to the same iso-agglutination group, there may occur, however, after transfusion, reactions of unknown nature, which are probably of not so severe or serious a nature as hemolysis.

Agglutination often does not occur *in vivo*, and if it does, does not always cause a severe reaction because of the following three factors, which have been discussed: interference with agglutination by an excess of non-agglutinable cells, absorption of the agglutinin by the agglutinable cells, and the degree of concentration of the agglutinin.

Hemolysis does not always occur *in vivo*, when donor and recipient belong to different iso-agglutination groups, because but about 20% of sera that are agglutinative are hemolytic. Hemolysis, however, never occurs without being preceded by or associated with agglutination.

If hemolysins are present in the plasma of donor or recipient, or both, hemolysis may not occur, or may cause but a slight reaction *in vivo*, because of the following factors and their quantitative relation to each other: concentration of the hemolysin, concentration of the anti-hemolysin, and a certain degree of absorption of the hemolysin by the hemolyzable cells. In discussing these factors, it was pointed out that in certain instances the knowledge of the strength of the anti-hemolysin might be of value.

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For references to the earlier work on the human iso-agglutinins see Landsteiner and Leiner and also Langer.

OBSERVATIONS ON THE USE OF THE DUODENAL TUBE FOR DIAGNOSIS AND TREATMENT.*

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(*Continued from page* 636)

USE OF THE TUBE IN DIAGNOSIS.

Einhorn, Gross, Frank, Bondi, Okada and Crohn in the last five years have described the use of the duodenal tube for diagnosis in adults, and Hess and others its use in infants. In our cases the tube was introduced by the rapid or slower methods already described. Duodenal juice was taken one to two hours after a drink of clear tea with sugar, to stimulate secretion. It was aspirated with a syringe or rubber bulb and examined for ferments, bile and sediments after noting its color appearance, and reaction to litmus. If not examined at once it was kept on ice a few hours. The Gross-Fuld test was used for trypsin, the Wohlgemuth test for amylase, and the ethyl butyrate test for lipase.

On the advice of Professor Folin of the department of biological chemistry at Harvard, and of Professor Mendell of Yale, these ferment tests were chosen as being decidedly more accurate and satisfactory than the use of Metts tubes as described by Einhorn.

Delicate chemical tests for blood seemed out of place.

The technic of the tests was as follows

In the test for trypsin we determined what dilution of the duodenal juice would completely digest 10 c.c. of the 1-10% casein solution in one hour in a water bath at 37° C. One c.c. of duodenal contents was diluted with 99 c.c. of water. In several test tubes were placed 0.1 c.c., 0.2 c.c., 1.0 c.c. and 2.0 c.c., respectively of the diluted contents. To each tube was added 10 c.c. of a 1-10% alkaline casein solution. The dilutions were 1-10,000, 1-5,000, 1-1000 and 1-500, respectively, of the duodenal juice. In cases of suspected pancreatic disease dilutions of 1-100 and 1-10 were made. After one hour's digestion a little 1-2% acetic acid was added to each, to precipitate undigested casein. Under normal

* Read at the thirtieth annual meeting of the Association of American Physicians, Washington, D. C., May 11, 1915.

conditions the 1-10,000 dilution usually became cloudy with undigested casein and the other three dilutions remained clear. Occasionally the 1-5000 dilution became slightly cloudy. Clouding of the 1-1000 or 1-500 dilution showed absence or very marked diminution of trypsin.

In the test for lipase we determined the acidity developed by the digestion of 1 c.c., of ethyl butyrate by 1 c.c. of undiluted duodenal juice in 24 hours at 37° C., in terms of c.c. of $\frac{N}{20}$ NaOH. Into each of two test tubes was placed 1 c.c. of duodenal juice. One was boiled for control. To each tube was added 1 c.c. of neutral ethyl butyrate, 10 c.c. of distilled water and 1 c.c. of toluene. These were placed in an incubator at 37° C. for 24 hours, then both titrated with $\frac{N}{20}$ NaOH, using phenolphthalein as indicator. The result in the control tube was subtracted from the other to give the final result.

In the test for amylase we determined the number of c.c. of 1% starch solution digested by 1 c.c. of duodenal juice in one hour at 37° C. In each of five small test tubes were placed 5 c.c. of a 1% starch solution. One c.c. of the duodenal juice was diluted with 1 c.c. of water, and 1.0 c.c., 0.5 c.c., 0.2 c.c., and 0.1 c.c. of the diluted juice were added respectively to four of the test tubes. The fifth tube served as a control. The tubes were incubated at 37° C. for one hour and then tested for undigested starch with Lugol's solution. The last tube of the series which failed to react was the one from which the reading was taken. The ferment activity is expressed in the number of c.c. of starch solution 1 c.c. of undiluted juice can digest. If it takes 1 c.c. of juice to digest 5 c.c. of starch the activity is 5; if digestion is accomplished by 0.5 c.c it is 10, etc. The activity figures for the four tubes diluted as above are 10, 20, 50, and 100

In only seven out of fifty-six cases did we fail to get duodenal juice for examination. We could not get the tube into the duodenum in three cases on account of pyloric obstruction, and in one case on account of marked gastroptosis and atony; in three cases the tube plugged persistently with mucus and the attempt was given up. In most cases aspiration was prompt and easy. In a few, careful technic and repetition of aspiration, or washing out of the tube were needed. The tube is as safe as the ordinary stomach tube, perhaps safer, and is much less disagreeable. Gentle aspiration never gave trouble. The duodenal juices were tested as controls in a series of normal and miscellaneous cases including cases where the tube was used for treatment. The results are tabulated.

The color was usually yellow, golden or greenish and its chief value was to indicate the presence or absence of bile. The juice was usually clear, but often cloudy in cases without known disease of the duodenum or bile passages, and was usually cloudy in diseases of the liver or pancreas. The reaction was usually neutral or slightly alkaline but often was slightly acid from the presence of gastric juice. It is often stated that the reaction in the duodenum is alkaline; this is not the case. The reaction depends on the combination of alkaline, pancreatic and intestinal juices with the acid gastric secretion. They may neutralize each other and there is occasionally an excess of acid.

Gross blood was found only in two cases of cancer of the pancreas.

Tests for bile have little value; various tests were used, modifications of Huppert's and Rosin's tests, without getting accurate results. The simple tests were rough, the elaborate tests little better. Practically, as much could be told by the color of the duodenal juice as by the tests. For this reason we have recorded the color and appearance of the juice but not the results of the bile tests.

A positive test for bile in the duodenal contents is the surest and best proof that the ducts are, at least, partly open. A negative test for bile cannot be taken as absolute proof of closure of the ducts owing to the unsatisfactory nature of the present tests.

The results of the ferment tests showed much apparent variation in different cases and from day to day in the same cases.

There are several factors which account for this: first the variation in the reaction of the juices; second, the dilution of the pancreatic juice with the gastric juice and with more or less bile, and, third, the lack of strictly quantitative methods of analysis.

On this account only marked diminution or absence of ferments has value in diagnosis.

Our results are, in general, in agreement with those of previous observers. It is unfortunate that details of analyses and methods of recording results by different men vary so much that there is some difficulty in comparing their results. Some of the apparent accuracy of tables of ferment analyses is really fictitious.

The three ferments, trypsin, amylase and lipase usually varied together, but of the three, trypsin was the most constant and reliable, the lipase next and the amylase last, the latter being occasionally absent when the other ferments were normal in cases without known pancreatic disease.

In Einhorn's cases trypsin was occasionally missed when other ferments were present; I believe this is due to the use of a less accurate method.

In our cases tests for all three ferments were made for completeness, but for clinical purposes the test for trypsin has far the greatest value, and it seems as if the examination might be simplified by omitting tests for the other two ferments without losing much. Amylase and lipase were never both present when trypsin was absent.

Examination of the sediment usually proved of little value.

DISEASES OF THE PANCREAS.

The examination of the duodenal juice is the most direct and valuable test of the pancreatic secretion. It is easy in most cases to get the juice for examination, and the results are apparently quite accurate, far more so than in other tests. It avoids the many variable factors and great technical difficulties in the use of other methods such as the Sahli glutoid capsule and Schmidt's nuclear tests, the use of the oil test meal, tests of the *feces* for ferments, and other indirect methods.

It is better to examine the duodenal contents for pancreatic ferments rather than the feces; in the same way it is better to test the stomach contents for rennet and for pepsin rather than the stool. In the feces we have pancreatic ferments mixed with non-pancreatic ferments such as bacterial, leukocytic and other cellular ferments, as well as intestinal lipase and erepsin. In addition we cannot tell how much pancreatic ferment has been absorbed or used up in the small intestine.

In our cases (with one exception) adults without known pancreatic disease all had active trypsin, or to put it another way, *constant* marked diminution or absence of trypsin was found (with one exception) only in known pancreatic cases of which we have six, four cancer, diagnosed by operation or autopsy, two chronic indurative pancreatitis diagnosed, one by autopsy and one by characteristic history, feces, and physical examination. We have included only proved cases of pancreatitis in our series. We consider the mere "feeling a rather hard gland" by the surgeon at operation as very poor evidence.

Chronic jaundice, cachexia and chronic ill health may lessen secretion somewhat, but rarely below normal limits. A negative test has definite value in diagnosis; a positive test (presence of ferments) does not rule out pancreatic disease. In two cases of cancer of the pancreas with palpable tumor, ferments were present.

In one or two pancreatic cases the absence of ferments was clearly shown by ordinary chemical and microscopic examination of the feces after the Schmidt-Strassburger test diet. In others, particularly where jaundice was present, the tests of the duodenal juice were much more definite.

We must admit that pancreatic cases with little loss of function are very hard to diagnose by any method and that cases with very marked loss of function are often obvious without any very special tests, but between these is a wide middle ground where the duodenal tube is the most accurate and valuable method of diagnosis.

Einhorn's elaborate classification of five varieties of pancreatic secretion, normal, increased, diminished, disturbed and variable pancreatic secretion (eu-, hyper-, hypo-, dys-, and heteropancreatism) determined by analyses of the duodenal juice does not rest on a firm basis for the reasons given above. The Metts tubes, which he has largely used, are convenient and useful for qualitative tests but unreliable for quantitative work.

DISEASES OF THE LIVER.

Here the use of the tube has less clinical value. It is probably the best method we have of deciding whether the bile passages are completely or partly closed, by noting the presence or absence of bile in the duodenal juice. Unfortunately this value is much limited by the lack of a good test for bile. Positive tests have value; negative tests are doubtful.

The presence of bile in the duodenal juices is the best proof we have that the common duct is, at least, partly open. Several times bile was found in the duodenal juice when there was none in the feces. In most of the normal and miscellaneous cases, bile was present. In most of the benign diseases of the liver such as gallstones, cholangitis, and cirrhosis even when jaundiced, bile was also present. In most of the cases of cancer involving the bile passages bile was not found. In short, we may say in the jaundiced cases, that the presence of bile in the duodenal juice favors benign disease, and repeated absence favors malignant disease. There are so many exceptions, however, that the test has little value in the diagnosis of the individual case.

Our cases are too few for conclusions. Crohn, from a larger experience, has found bile almost always present in impacted gall-stones even with long jaundice, and almost always absent in jaundice due to growth and, therefore, concludes, that complete absence of bile from the duodenal juice is a valuable sign of local cancer. We cannot agree with this on account of the variability of the bile tests in the duodenal juice.

In normal cases not much sediment or flaky mucus is found; we usually got a ropy, greenish fluid which may be clear or cloudy; on the other hand, in cholecystitis or duodenitis we have sometimes found turbidity, mucus, or pus cells; gallstone sand was found in one case of gall-stones. These signs have seemed rather uncertain guides in diagnosis, and, as in diseases of the stomach, I believe sediments have minor importance.

DISEASES OF THE STOMACH.

I have used the duodenal tube frequently for obtaining stomach contents in place of the usual stomach tube. It takes about a minute longer to get in than the usual stomach tube which can be quickly pushed down, but once past the larynx it is far more comfortable and the patients sit quietly as long as desired while the stomach contents is aspirated. It can be obtained and used for examinations of the gastric secretions at intervals of 15 or 20 minutes according to the method of Rehfuss.

The tube does not kink or curl up like the ordinary stomach tube, but sinks to the bottom of the stomach in the erect patient and is more reliable than the usual stomach tube for aspirating small amounts of clear fasting contents. Occasionally it blocks with food or mucus.

The pancreatic ferments in the miscellaneous stomach cases were normal save in two cases. One case of gastric neurosis showed almost complete absence of ferments on the first examination and normal ferments on the second. One case of chronic gastritis showed almost complete absence of ferments on two examinations. I have no satisfactory explanation.

It is worth noting that in three cases of achylia gastrica the pancreatic ferments were normal. This accords with previous data in showing how little pancreatic secretion depends on gastric acidity.

TABLE OF ANALYSES OF DUODENAL SECRETION.

No.	Disease.	Amount.	Appearance.	Color.	Reaction.	Trypsin.	Lipase.	Amylase.
	Normal and Miscellaneous.							
1.	Normal	19	Cloudy	Golden	Neutral	1/1,000	0.4	20
2.	"	5	Clear	"	"	1/500	0.6	20
3.	"	20	"	"	"	1/5,000	2.4	20
4.	"	15	"	"	"	1/5,000	1.2	50
5.	"	20	"	"	"	1/500	2.6	20
6.	Tuberculosis lungs	10	"	"	Sl. acid	1/5,000	2.9	0
		12	"	"	" "	1/1,000	3.6	0
7.	Neurasthenia	10	Cloudy	"	" "	1/5,000	0.7	10
		25	"	"	Neutral	1/10,000	1.5	20
8.	Neurasthenia	10	"	"	"	1/5,000	1.7	10
		12	"	"	Sl. acid	1/1,000	2.0	0
9.	Pernicious anemia	22	Clear	"	Neutral	1/1,000	2.5	10
		17	"	"	"	1/5,000	1.5	50
10.	Chronic arthritis	19	"	"	Sl. alkaline	1/5,000	0.9	20
		7	Cloudy	"	" "	1/1,000	0.9	100
11.	Chronic appendicitis	30	"	"	Neutral	1/1,000	9.6	50
12.	Nervous vomiting	10	Clear	"	"	1/5,000	3.9	20
13.	Nervous Vomiting	14	"	"	"	1/5,000	4.5	50
14.	Constipation	24	"	"	"	1/1,000	2.0	10
15.	Constipation	24	"	"	"	1/5,000	4.0	50
	Diseases of the Stomach.				Reaction to Litmus.			
16.	Chronic gastric ulcer	20	"	"	Neutral	1/1,000	0.4	100
		15	"	"	"	1/5,000	0.7	0
17.	Chronic gastric ulcer	20	"	"	"	1/5,000	0.4	100
		7	"	"	Sl. alkaline	1/10,000	0.5	100
18.	Duodenal ulcer	7	"	"	Neutral	1/5,000	1.2	0
		5	"	"	Sl. alkaline	1/1,000	0.7	10
19.	Gastric ulcer	27	Cloudy	Yellow	Sl. acid	1/10,000	0.4	0
		30	"	"	" "	1/10,000	0.3	20
20.	Duodenal ulcer	15	Clear	"	Neutral	1/10,000	2.4	20
		10	"	"	"	1/10,000	2.0	20
21.	Gastroptosis	12	"	"	"	1/1,000	2.0	0
22.	Gastroptosis	9	"	"	"	1/5,000	1.0	10
23.	Gastric ulcer	7	Cloudy	"	"	1/5,000	0.5	100
24.	Chronic gastritis	3	Clear	Yellow	"	1/1,000	2.4	50
25.	Gastric atony	10	Cloudy	"	"	1/10,000	0.9	50
26.	Gastric atony	20	Clear	"	"	1/1,000	3.5	50
27.	Gastric neurosis	5	"	Golden	"	0	0.2	0
		14	"	"	"	1/5,000	4.7	20
28.	Gastric neurosis	10	"	"	"	1/10,000	3.7	20
29.	Chronic gastritis	35	"	Yellow	"	1/1,000	5.0	20
30.	Chronic gastritis	15	Cloudy	"	"	0	0	0
		13	"	"	"	0	1.9	0
31.	Achylia	15	Clear	Golden	Neutral	1/5,000	1.2	50
32.	Achylia	25	Cloudy	"	"	1/10,000	1.5	20
33.	Achylia	30	"	"	"	1/1,000	9.5	50
	Diseases of the Pancreas.							
34.	Cancer of head*	5	"	Yellow	Alkaline	0	0	0
		8	"	"	"	0	0	0
35.	Chronic pancreatitis	8	Sl. cloudy	Yellow	Neutral	0	0.4	0
		19	"	Gray	"	0	0	0
36.	Cancer of head*	30	Cloudy	"	"	1/10,000	1.5	50
		2	"	"	"	1/10,000	.8	20
37.	Cancer of head*	10	Sl. cloudy	Yellow	Alkaline	1/10,000	2.1	50
		30	"	"	"	1/5,000	3.1	20
38.	Chronic pancreatitis*	17	"	"	Neutral	1/1,000	2.2	0
		13	Clear	Golden	"	1/1,000	2.0	0
39.	Cancer of head†	19	Cloudy	Watery	"	0	0	0
		8	"	"	"	0	0	0

Diseases of the Liver.

40.	Cancer of gall-bladder*	10	Cloudy	Yellow	Sl. acid	1/1,000	1.6	0
		5	"	"	" "	1/500	1.5	0
41.	Catarrhal jaundice	9	"	"	Neutral	1/1,000	0.2	100
42.	Alcoholic cirrhosis	10	"	"	"	1/1,000	0.2	20
		14	"	"	"	1/1,000	—	100
43.	Alcoholic cirrhosis	15	Clear	"	Sl. alkaline	1/10,000	1.6	100
44.	Catarrhal jaundice	10	Cloudy	"	Neutral	1/10,000	6.0	100
		30	"	"	"	1/10,000	—	50
45.	Gall-stones*	20	"	"	Sl. acid	1/5,000	0	20
		50	"	"	" "	1/1,000	8	50
46.	Gall-stones*	30	Cloudy	Greenish	Neutral	1/10,000	3.5	50
		31	Clear	Golden	"	1/5,000	0.5	10
47.	Gall-stones*	15	"	"	"	1/10,000	0	50
		12	"	"	"	1/10,000	3	50
48.	Cancer of gall-bladder*	10	Cloudy	Yellow	"	1/5,000	1.5	50
		6	"	"	Sl. alkaline	1/1,000	1.5	50
49.	Cancer of bile ducts†	8	"	"	Neutral	1/500	0	0

* Operation. † Autopsy.

(*To be continued.*)

GASTRIC ULCER EXPERIMENTALLY PRODUCED BY MEANS OF THE STAPHYLOCOCCUS ORGANISM: A PRELIMINARY NOTE.

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CINCINNATI, OHIO.

[From the Laboratories of the Cincinnati General Hospital.]

THE purpose of this note is to record briefly some observations relating to the production of gastric ulcers by means of the staphylococcus organism and a decinormal solution of acetic acid. The organism was obtained from a case of septicaemia in man. At first cultures of it injected intravenously into rabbits were found to produce a septico-pyaemia, but later, after cultivation in the wall of the living stomach of the rabbit, it showed on intravenous injection an affinity for the intestinal tract, locating most often in the appendix and occasionally in the stomach. Cultures from foci in different organs were made on agar and in ascitic dextrose broth, and from these growths, standard emulsions were made as follows:

An emulsion from the agar growth was prepared by suspending a 24-hour-old culture on agar slant in 10 c.c. normal saline; and from the broth by suspending in 15 c.c. of saline the centrifuged sediment of a 24-hour-old 150 c.c. broth growth. The dose of the emulsion was from one-quarter to 1 c.c., and of the acid 1 c.c. The materials in all cases were introduced through a hypodermic needle. When a local injection into the stomach wall was given, it was preceded by a laparotomy and the injections were always made into the pyloric end of the stomach. When both acid and emulsion were employed locally in the same stomach, the injections were made about one-quarter of an inch apart. Rabbits were used in all experiments and killed with ether at different times, ranging from one to six days. Postmortems were made, when possible, immediately after death of the animal.

Based on the study of 40 injected animals, the following statements are made. A full report will be published later.

1. Typical peptic ulcers varying from one-quarter of an inch to one inch in diameter were produced by injecting locally into the stomach wall the staphylococcus organism of certain grades of virulence and a weak acetic acid solution. (See Figs. 1, 2 and 3). All staphylococcus cultures would not answer the purpose—an organism of special virulence (for instance, one freshly isolated from the appendix) was necessary to produce the lesion.

FIG. 1.—Pyloric end of stomach showing early stage of ulcers.

a. The injection of the organism alone usually caused the development of a small localized and firmly walled off abscess at the point of injection. Such an abscess, as a rule, was absorbed in the course of four to six days and never showed any involvement of the mucous or peritoneal coats. In some cases no abscess was formed.

b. The introduction of the acid alone into the stomach wall beyond causing more or less oedema provoked no gross pathological change in the tissues. It certainly never caused an ulcer; but it did seem to increase the susceptibility

of the area for localization of the staphylococcus injected into the general circulation.

2. The tendency of selective localization in certain organs was found to depend among other

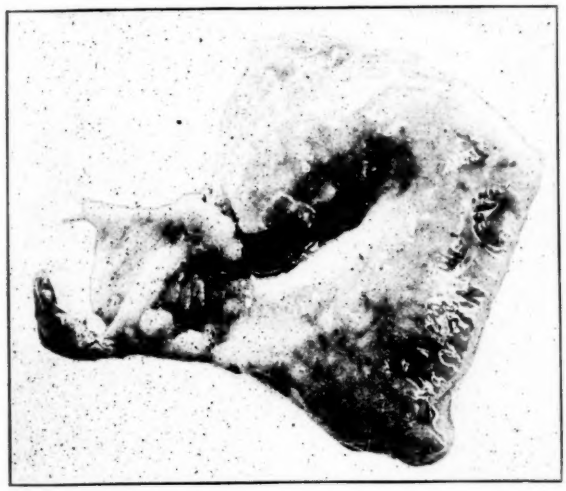

FIG. 2.—Multiple ulcers of pylorus. The base of the one bordering on the duodenum is covered with digested blood. The other ulcer is clean. Both have the punched-out appearance.

things upon the virulence of the organism and could be modified by cultivation in functionating tissue. For instance, a culture of the organism isolated from a joint was apt to form on intravenous injection a septico-pyaemia with abscesses predominating in the skeletal and myo-

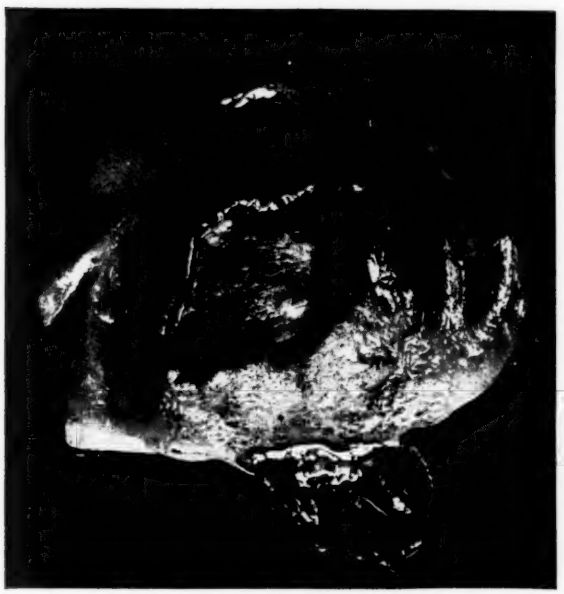

FIG. 3.—Large ulcer of pylorus, showing the undermined edges and muscular floor.

cardial muscles; that from the appendix showed an affinity for the intestinal tract, so that at times the appendix was the only organ revealing any gross lesion.

In the light of the above results, it seems possible that the staphylococcus is responsible for certain cases of gastric ulcer in human beings. If by some means (through an erosion or trauma, etc.), a hyperacid gastric juice enters the tissues of a limited area of the stomach wall and the staphylococcus of proper virulence (for example from the appendix) finds lodgment there, it does seem quite probable that the necessary conditions used in producing the experimental ulcer would be duplicated. This point is still under study.

I wish to thank Drs. Paul G. Woolley and William B. Wherry for their valuable assistance in connection with this work. To Mr. Oscar Haude, I am indebted for the photographs.

THE FALLACIES OF GROUP TREATMENT.

BY HERBERT J. CRONIN, M.D., CAMBRIDGE, MASS.

THE medical profession is today in a state of the highest organization. We refute the arguments made by Dr. Richard C. Cabot in a recent number of a popular magazine[1], that medical practice is in a badly organized condition because accurate diagnosis requires the services of a group of specialists who are not available to the majority without excessive expense. His solution is for a group of individuals to pay a fixed yearly fee to a group of specialists and then receive without further expense, group diagnosis and treatment. The idea is based on the plan of the University of California clinic, for which the students pay five dollars a year and receive complete medical attention.

EVERY GENERAL PRACTITIONER THE CENTER OF A MEDICAL GROUP.

Every general practitioner groups about him a corps of specialists, on whom he constantly calls when in need. In this group there is usually an eye, ear, nose, and throat specialist, a general surgeon, an internist, an x-ray man, and a dentist. Although there may be no definite contract between the members and the general practitioner, there is a gentleman's agreement that each will give his best advice and treatment. The financial condition of the patient, with the advice of the general practitioner, will decide the question of fees. Only the most able men in their particular line are picked to be members of a group, while a man's results will determine his continuance in it. As the general practitioner's business grows, he will add, perhaps, a gynecologist, a pediatrician, or a neurologist. He will make terms with a private hospital so that patients unable to pay the full rates may be admitted at reduced terms. The general practitioner lays no claim to being an all-around specialist,—but he

[1] American Magazine, April, 1916. "Better Doctoring for Less Money," by Dr. Richard C. Cabot.

is able to give the best advice and treatment in all the specialties through this system. His group is always ready and anxious to help him; he can choose his consultant when the patient's condition demands; and as a result of his organization, his patient reaps the benefit of the *best treatment at the least expense.*

ALL NECESSARY SCIENTIFIC TESTS PROVIDED FREE BY THE STATE OF MASSACHUSETTS.

The State of Massachusetts provides free every test that is of great importance to the public health that requires special knowledge or apparatus. It is true, as the doctor writes:

"He (the general practitioner) cannot pack into his grip an up-to-date x-ray machine, a selection of guinea-pigs, rabbits, sheep, or other animals which may be necessary for the performance of modern laboratory tests."

Yet the general practitioner is in no way hindered in his practice because he is unable to carry out himself all the possible scientific tests. Most of the ordinary common tests, such as examination of the urine, stomach contents, and blood smears, he can do in his own private laboratory. The more complicated ones that the state does are the Wassermann test for syphilis; the examination of the blood for typhoid or malaria; the sputum for tuberculosis; throat cultures for diphtheria; and the smears for ophthalmia. In addition, the antitoxin for diphtheria and tetanus, as well as the anti-rabitic and anti-typhoid serum are given free to the general practitioner. There is also a certain number of highly complicated tests used in some hospitals, but often their results are rendered useless because of the number of exceptions to their application. Some of the cleverest surgeons I have seen have been guided more by their deep knowledge of medicine and their broad clinical experience, rather than by the results of questionable tests.

Modern medical science has developed a type of man, common among hospital internes, that is unable to make a diagnosis, even in a simple case, without the aid of many scientific tests. The value of these tests is so over-estimated that well-defined, visible signs of disease are often not observed or are ignored. The most valuable assets of the skillful diagnostician are a few tests, coupled with the power of acute perception and accurate observation of the clinical aspects of the patient.

THE UNIVERSITY OF CALIFORNIA CLINIC.

The University of California maintains a hospital and corps of doctors by assessing the 7000 students five dollars a year each. It was from this clinic that Dr. Cabot got his idea of group treatment, and since has suggested that it be applied to the community as a whole. Yet these students are picked young people between the ages of eighteen and twenty-five, descended from the best stock in California and living in the healthiest parts of their lives. Unless they had been physically fit, they probably would have been unable to enter college, and surely would not remain there if in poor health.

It is remarkable to me that there is need of a dispensary at all when I consider the claims of the breezy Californians, extolling their unequalled climate, with its health-producing qualities. Dr. Cabot saw "the students pouring into the clinic, many of them apparently in splendid health." What kind of young people are they? Can they be a group of neurasthenics, or were they trying to get their money's worth because they could "visit the doctor for nothing"?

This particular plan that is successful at this college, and which might be applied to manufacturing plants or industrial groups, is most grotesque when we think of using it with the general public. As sickness is most common in childhood and old age, it would mean that, with the exception of the young and healthy, a large part of the community would be in a hospital most of the time!

THE STILLMAN INFIRMARY AT HARVARD.

Harvard University has an ideal system, that takes the best possible care of its students. On entrance to college, every freshman is given a complete physical examination. A physician is at the college daily who can be consulted on all matters relating to health. The Stillman Infirmary is the university hospital, and for its use for two weeks each year, the students are assessed four dollars yearly. They are not restricted while there to any particular doctor, but may, at their own expense, choose whatever physician they wish. If in straightened circumstances, they will be treated free by the physician-in-chief, who is a general practitioner; and if special treatment is needed, there is a corps of specialists associated with him that will give their services free.

This system used at the Stillman Infirmary is most excellent. The hospital expense is four dollars a year to all; the medical charges are arranged so that a man financially able to pay, can give a fee commensurate with the services rendered, while the needy student is given all treatment free. It is very much the same idea that most general practitioners use so successfully in their daily practice.

THE HOSPITAL DIAGNOSIS COMPARED WITH THAT OF THE PHYSICIAN WHO REFERRED THE CASE.

The average general practitioner can say that his practice is roughly made up of fifty per cent. of simple, readily treated cases. Twenty-five per cent. are moderately serious conditions, such as pneumonias, fractures, etc., but handled without further assistance; the other twenty-five per cent. are cases that require consultation with some members of his group, or are sent to a hospital for further treatment. When the gen-

eral practitioner compares his diagnosis with that of the hospital, he usually is proven to be right. A diagnosis is not made by magic,—careful study of the case with the application of common well-known tests, that every practitioner can use, is the only method.

While I was a house officer at the Boston City Hospital, I was interested to see how the diagnosis of the physician who referred the case checked up with the hospital diagnosis after we had used the tests we thought necessary; and I discovered that the practitioner had diagnosed the condition correctly in about eighty per cent. of the cases. This is a remarkable record, when it is remembered that perhaps the patient was seen only once, and then in a poor light, or merely a provisional diagnosis was made, as it was obviously a case for hospital treatment. Sometimes a post-mortem examination proved the hospital diagnosis to be wrong, even though the case had received long and careful study. The cases at the Boston City Hospital can be compared to those of the average practitioner because they are the rank and file of the ordinary medical cases. It takes under its care any citizen of Boston who is sick and applies for treatment, regardless of whether his condition might prove interesting from the medical standpoint. Hence the results obtained and those of the practitioner are somewhat similar.

THE MEDICAL TRAINING OF THE GENERAL PRACTITIONER.

The general practitioner today receives an excellent training at medical school in the rudiments of all the specialties. After graduating, most of the men take a hospital appointment of a year or so, and perhaps later, post-graduate courses. By visiting the various clinics and studying the medical journals, they keep abreast with the advances in modern medicine. Competition is so keen that they must do these things if they are going to get results with their cases. Yet Dr. Cabot writes that:

"Those who attend the best of our large public hospitals free or for trifling fees are really the aristocrats among patients. Those who call a physician to their houses or visit him at his office are the unfortunates, doomed to pay high for a relatively poor bit of service."

The general practitioner does not imagine that he is able to treat or operate on all troubles; yet he can recognize such conditions and refer the case to a man who is able to properly handle it. Let the practitioner make a careful, thorough physical examination, and if there is trouble present, he will be able to find it.

LODGE WORK AT CONTRACT PRICES.

Lodge work has been the commonest form of group work at contract prices here in the East. An organization will assess its members a dollar or so a year and engage a doctor to look after the health of the group by the year. The work is nearly always unsatisfactory, both to the doctor and to the members, who have a peculiar mental obsession that because you are receiving only a fixed fee per year you will give them as little consideration as possible,—while to avoid treating them, you will tell them that they are well and able to work, when they may be in poor physical condition. Some think that you regard them as pests, and the really sensitive ones will engage a private doctor and pay him, rather than have the lodge doctor free.

When a man is sick, his mentality changes. During the long hours of sickness, the lodge member becomes suspicious of everything; he quickly decides to take no chances with a man not paid by himself, and not working for his interests alone. He usually engages his family doctor, and is then sure that he will not be neglected because he is merely a member of some group or lodge, and that his doctor's fee is limited to the pay of the lodge.

INCONSISTENCY OF STATEMENTS.

Like so many well-meaning reformers, Dr. Cabot has a tendency to be inconsistent in his statements. At the University of California, he saw "the students pouring into the clinic. They were coming because they needed advice about trifling ailments which, if treated in their trifling stage, might very possibly be prevented from becoming serious." That seems logical enough, but what a surprise to read further in his article: "Many patients have a decided proneness to acquire the 'doctor habit'; I mean the habit of running to a doctor frequently for all sorts of minor ills. Such a habit is often very bad for the patient." Yet to return to our students, "they were eager to go to him in a stage of the troubles which the doctor very seldom has the opportunity to see,—that precious early stage, which ordinarily has passed by before the patient is driven to face the expense and trouble of a doctor's visit."

In other words, it is all right for the students to visit the free clinic if they have minor ailments; but after they have graduated and wish to consult their family doctor for similar conditions and pay him a fee, they are running danger of contracting a habit that can almost be compared with the morphine habit!

Crime and disease walk hand in hand. Are there people who think that our honorable judges are conniving with criminals for the continuation of crime,—and that they are not laboring to stamp out all vice? It is surely to their interest that crime exists: without it, they would lose their livelihood. Can you then agree with Dr. Cabot in that, "It is not the practitioners' interest that people should keep well or should suppose themselves to be well in a short time?" What a calumny to heap upon the general practitioner, who has been always in the van-guard of every campaign launched for the prevention of disease!

HEALTH INSURANCE.

The greatest hardship for the average family at the time of sickness is not the doctor's bills, but the fact that the weekly wage has stopped. Not only the family suffer, but the tradespeople receive severe losses, since they are unable to collect their just debts. To get relief from this distressing condition, any one may join a group of individuals and have guaranteed during sickness a weekly income of from ten to fifty dollars a week by paying a small yearly sum into the common treasury. This relief is designated by the prosaic name of Accident and Health Insurance and the payments are called premiums. It is open to all, but few take advantage of it.

MEDICINE A PUBLIC CHARITY?

When all these problems are given quiet consideration, should a man so bitterly malign the entire profession merely to give higher color to his favorite ideas? How can he remain a professor at Harvard Medical School, which is yearly turning out scores of young men to become general practitioners, if he believes the substance of his own statements,—that such men are going to prey on the general public, and will be little better than ignorant charlatans! Should even the insane desire for publicity seduce any physician to trample into the mire the recognized standards of the profession,—truth and sincerity?

Sometimes one wonders if medicine is to become a public charity and its service to be classed like that of the almshouses. Why do so many that could pay, rush to a free hospital to be operated on for nothing, and even then begrudge the hospital its small fee? The same parties will spend their last dollar to win a law suit and not grumble about it.

Dr. Cabot advises the public to go to a public hospital, for it is only there that one can get accurate diagnosis, and that for nothing. Then, why not all patronize the bread line and the soup kitchen? The bread and soup are excellent, and will cost us nothing!

Medical Progress.

TENTH REPORT OF PROGRESS IN ORTHOPÆDIC SURGERY.*

BY ROBERT B. OSGOOD, M.D., ROBERT SOUTTER, M.D., C. HERMANN BUCHOLZ, M.D., HARRY C. LOW, M.D., MURRAY S. DANFORTH, M.D., BOSTON.

(*Continued from page 658.*)

ORTHOPÆDIC WAR SURGERY.

Tendon Suture.

Wagner[75] has seen a considerable number of cases of injuries to the extensor tendons of the fingers which generally lead to a flexion contracture, making the patient unfit for work or duty. A simple secondary suture or plastic operation which can be done under local anesthetic as a rule leads to recovery within four weeks. The distance between the ends of the tendons has been in his cases 1/2 to 6 cms. Wagner illustrates a number of simple methods for secondary suture and plastic operation, generally not much different from the methods described in the text-books. In order to prevent adhesions of the newly formed tendon Wagner has placed them in calves' arteries, either conserved in Ringer solution or taken fresh from the animal and placed for half an hour in 3% Hyperol solution. Wagner has found, however, that it is not necessary to use such materials, but that the best results are obtained by having the newly formed tendon move at once. Most cases have no splints at all, and are advised to move the fingers actively and passively from the very day of the operation. Wagner does not think it advisable to suture ends of the tendons while the finger is hyperextended, because the tension is too great, which may invite secondary rupture. Furthermore, movement of the fingers is limited and adhesions are thus favored.

Infected Wounds of Joints.

Burckhardt and Landois[76] advise a resection in infected joints in which there has been a moderate destruction of bone, and when the patient is in good general condition and can remain in the same hospital for after-care. They believe that this method affords a better chance for future function and often avoids amputation. They regard the chances of success to be expected from the operation to be best in the hand, next in the foot, the elbow, the knee, the shoulder, and last of all in the hip. In infected shoulder and hip joints they regard the prognosis even with resection as dubious. In these joints resection should be the last resource and primary simple drainage with fixation the routine.

Doberauer[77] has observed an interesting case of an infected elbow joint, in which the bullet made a hole in the olecranon process. The drainage was perfect and the functional result excellent. Since this case Doberauer has systematically trephined the olecranon in all cases requiring drainage of the elbow. He considers the advantages to be drainage by gravity, at the same time leaving the muscles, ligaments, and nerves uninjured.

Haberer[78] is impressed by the fact that most wounds of joints do not become infected. It is dangerous to drain a joint wound from the beginning. Fixation and leaving the joints alone are the best initial treatments, except in gas phlegmons, where immediate action is necessary. The operative treatment is not required unless fever, pain, and swelling keep up, then the joint should be punctured. Where pus or purulent effusion is found a small incision is made and a rubber drain introduced, the cavity being washed out with a 1-4% solution of formaldehyde

* This report is based on a review of 440 articles selected from about 900 titles having to do with orthopædic surgery, appearing between Nov. 1, 1914, and Jan. 1, 1916. References are given to such articles only as have been selected for note and comment.

if the secretions are thick. The functional outcome is much better with multiple small incisions than with an extensive opening. In only one out of fifty cases of severe suppurating injuries of large joints has amputation become necessary. When there is general sepsis amputation is of no avail. In several such cases the autopsies showed that the joint lesion was healing well. Treatments should be directed against the septicemia. The patient should not be further weakened by a futile amputation.

Coenen[79] has treated a case of gunshot wound of the sacro-iliac joint in which the Trendelenberg sign was present. This led to the diagnosis of joint injury, and the x-ray showed the bullet in the sacro iliac joint. The patient on entrance could scarcely walk, complained of pain radiating into the right leg, the lumbar spine was rigid, and, as has been said, the pelvis sank on the side of the wound when he stood on the affected limb. The removal of the bullet resulted in the restoration of a normal gait.

Blind[80] makes a very timely plea for a coöperation between general and orthopædic surgery in all cases of bone and joint and muscle injury received in the war. He cites cases in which long immobilization in positions unfavorable for future function had resulted in an incapacity from which the patients could never fully recover.

(Ed. Note.—The importance of this coöperation cannot be too strongly emphasized. It has its advantages in the surgery of peace as well as of war, but no orthopædic surgeon who has had an opportunity to observe the methods of treatment and the joint positions maintained during convalescence in even the best base hospitals can fail to realize the surprising lack of preventive surgery which obtains. The help which orthopædic surgery can offer in the way of preserving function and conserving efficiency is a very real help and a help much needed.)

APPARATUS FOR THE LESIONS OF THE WAR.

The medical literature of the present time is very rich in description of all kinds of apparatus which have been devised to diminish suffering and promote restoration of disturbed function which have been caused by wounds of the war. There is more or less merit in all with which we are familiar, but certain types of apparatus seem to stand out as appealing to many general surgeons and orthopædic surgeons, and of these we shall speak.

Splints.

In English, Major Robert Jones'[81] little book on "Injuries to Joints" is most suggestive and helpful. Simple, ingenious, very practical splints are described and illustrated and the rationale of their uses explained in his characteristically clear and concise manner. There is little said concerning the uses of plaster of Paris and we suspect a prejudice born of some unfamiliarity with its varied uses. Splints seem to take first rank in the English treatment of compound fractures.

There has been published also a small book in German by Spitzy and Hartwich[82] which describes clearly the methods which they have followed in fresh injuries and deals most instructively with the care of convalescents and with the various cheap and efficient forms of protheses following amputations.

Plaster of Paris.

It is interesting to see how strong a hold plaster of Paris dressings have, especially in the hands of orthopædic men. The articles of Fayerweather,[83] Stoeger,[84] Lange,[85] Goebel,[86] Manson,[87] Hackenbruch,[88] Grasser,[89] Greenough, Osgood, and Vincent,[90] all indicate that the varied adaptations of plaster of Paris in the treatment of compound fractures are of great importance, and in the opinion of many other surgeons represent the methods of choice, sometimes combined with traction, sometimes alone. The comfort of the patient is certainly great with a properly applied plaster. Wide windows spanned by reinforced bridges of plaster give ample space for moist dressings and constant irrigation, and with a modicum of care arrangement can be made for the application of a tourniquet in case of a threatened secondary hemorrhage.

Overhead Supports.

We find also general satisfaction with the so-called Balkan method of treating compound fractures. The essential principle involved is an overhead frame, fastened to the bed, by which lifting and extending traction may be applied. This form of treatment has been employed at the American Ambulance in Paris, in the service of Dr. Joseph Blake, and by Jentzer[91] in Serbia and Switzerland.

Orth[92] has been impressed with its value in Germany, especially in fracture of the femur. The English base hospitals are well supplied with these frames.

Special Apparatus.

Especially in upper limb fractures and contractures of joints and muscles, German surgeons are finding the so-called ladder splint of Cramer of great adaptability. This splint, as the illustration shows, (Fig. 1) consists of a pair of parallel wires connected with finer wire cross bars, the whole bendable, but stiff enough to afford real splinting. These splints are used in connection with plaster of Paris or alone, and have proven most useful in the hands of Backhammer and Horn,[93] Heymann,[94] Borchers,[95] and Walter.[96]

An apparently useful apparatus for application of traction in the position of flexion in fractures of the thigh has been devised by Roschke,[97] (Fig. 2.) He, as well as Grundler,[98] Angerer,[99] Wildt,[100] and others, believe that traction and counter-traction are best maintained in fractures of the thigh by this position of flexion.

Welty's[101] apparatus for foot drop seems

very practical and easy to apply and adjust. The editors have had no experience with it, but

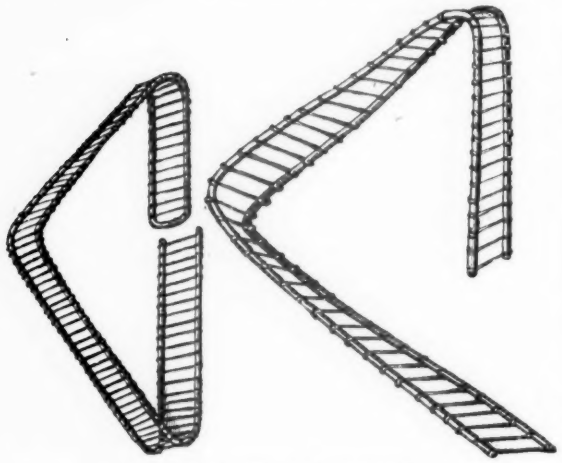

FIG. 1.—Cramer's ladder splint.

illustrate it since it appears to be so simple, (Fig. 3.)

Our space is too limited to describe other forms of apparatus, such as the woven wicker splints of Kessler,[102] and the telescopic splints of König,[103] but it is quite evident from a review of the literature of the war that orthopædic surgery is playing a most important part and is des-

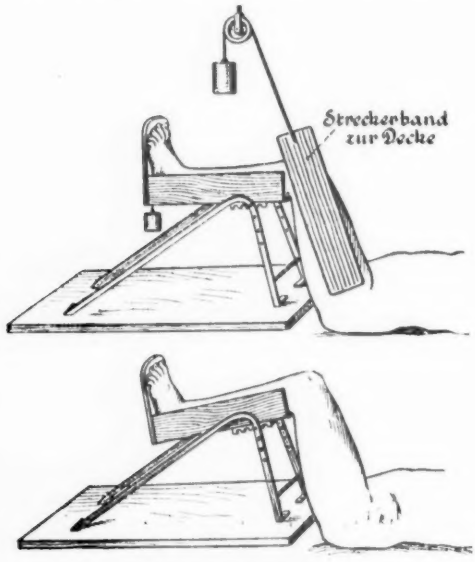

FIG. 2.—Roschke's apparatus for application of traction in a flexed position in fractures of the thigh.

tined to continue to do so after the fighting is over and the reconstruction period begins.

MECHANOTHERAPY.

This method of treatment is being more and more generally employed in France and Germany and possibly in the other warring countries as well, though the editors lack information in this regard. More and more surgeons are realizing the importance of the crippling sequelae of wounds and turning to mechanotherapy as the most sane and speedy method of relieving contractures and stimulating return of function. Thus "universal orthopædic apparatus" has been devised by Wunsch,[104] working on the principle of lever and pendulum, applicable even to the chest expansion. Several French "universal" machines have been invented, which are most valuable and ingenious, and are being used constantly at Berck-sur-Mer under the skillful supervision of Calvè, and in several

FIG. 3.—Welty's apparatus for the correction of foot drop.

places in Paris, including the American Ambulance. These machines will hardly replace the more specialized and varied types of Zander, but they have placed within reach of many more patients this important method of therapy.

THE PREVENTION OF CRIPPLING AND THE OCCUPATIONAL TRAINING OF CRIPPLES.

Laquerrière and Peyre[105] draw their conclusions from a service of 1200 beds in central physiotherapeutic and convalescent hospitals. They state first that fifteen to twenty per cent. of the less severe sequelae could have been avoided if it had been known how to apply proper therapeutic measures at the beginning. They insist that absolute immediate fixation of all wounded members is a prime requisite. They deplore too long continued fixation. They urge more careful prevention of possible future complications, such as contractures and malpositions. Three things are necessary to prevent the disabilities following the closing of a wound or the mending of a fracture: (1) Absolute immediate immobilization maintained till the base hospital is reached and then complete immobilization, only exceptionally; (2) rapid establishment of passive motion and massage; (3) the direction of this passive motion to the cause of the functional disabilities. Few instruments or special apparatus are necessary. Too great delay should not occur in operating on nerve traumata. Often neuropathies are mistaken for true nerve lesions. We could well add a fourth requisite in the prevention of disability, namely, when fixation is employed, it should be

maintained in position favoring future function.

In analogy to the Ten Commandments, Ritschl[106] reminds the military surgeon of certain important orthopædic facts which are known to the orthopædic surgeon, but often enough not sufficiently valued and recognized by all who have to do with injuries and other infections of joints. He emphasizes the importance of correct position, of avoiding too long fixation. He advises that special attention be paid to important extensors, such as the deltoid and the quadriceps. He refers to the importance of massage, hot air, etc., as effective means for the absorption of hematoma. His advice would seem to be not untimely at the present moment.

Vulpius[107] agrees with these rules, but opposes very strongly the one in which the sling is recommended for injuries of the shoulder. He calls attention to the severe impairment of the function of the arm when the shoulder is allowed to stiffen in an adducted position, and advocates quite wisely the position of abduction by some form of splint in order to avoid these very dangerous adduction contractures.

Training School for Maimed Soldiers.

Mosny[108] discusses what has been done in other lands for persons crippled by industrial and other accidents, and then describes the workings of the training school for crippled soldiers that has been in operation at Lyons since last December. The men live in the school during their course of training, and the institution in various ways is a model. Another training school to teach horticulture is being organized. These, Mosny states, are the only practical realizations in France to date of aid by professional re-education and re-adaptation to remunerative work for those mutilated or crippled in the war. At Lyons the men are taught to use the stump of the arm without regard to an artificial limb. The prothesis is to be selected later when the man has learned exactly what is best adapted to serve him in his work. Mosny discusses the general principles and special details of training the maimed to utilize the earning forces they have left and of finding employment for them. It is a task the country must assume, he adds, and it will require her ingenuity, all her material and moral forces, and all her goodness of heart. His plan contemplates loans to those who wish to set up a business for themselves.

One of the most suggestive attempts to meet the increasingly complex problems of the war cripples is under successful trial in Chailley in England. Here a well established industrial school for crippled children has opened its doors to the crippled soldiers, and while giving them a home, employs its original inmates, who have learned trades, to instruct in their turn their country's maimed patriots.

(Ed. Note.—Germany was prepared perhaps more than any other country to care for its cripples, but this burden is already a fearfully heavy one. It should stimulate our own endeavor in America to make proper provision for at least the cripples of peace. No phase of preparedness is of more sociologic or economic importance. With our present wholly inadequate provision for the occupational training of the cripples who are already among us, there can be no difference of opinion as to our proper course of action in this regard among the champions of either preparedness or pacificism.)

MISCELLANEOUS.

"Swollen Feet."

Jansen[109] has made an exhaustive study of the so-called swelling of the feet, an affection very frequently seen in marching soldiers. By a series of x-ray pictures Jansen proves that no fracture generally underlies this affection, but explains it by a spastic cramp of the interosseous muscles caused by over exertion. He thinks that these muscles by their cramp obstruct the circulation not only in the soft tissues but also in the firmer parts of the middle foot and lead by increased tension of the fluids within the tissues to edematous infiltration. While the swelling of the soft tissues is very extensive and capable of quick regeneration, that of the bony parts is only slight, but of prominent importance. The periosteum is responsible for the proliferation of bone as seen in x-rays. A very strong pull of the muscles on the edematous periosteum may easily lead to hematoma and irregular thickening. The substance of the bone itself does not swell, but its firmness diminishes, thus leading eventually to spontaneous fracture. This cramp of the muscles of the middle foot is analogous to that of the whole foot in the acute strain. Jansen, therefore, calls this affection "pes valgus contractus partialis," or the "contracted anterior foot," or "antepes contractus."

Juxta-articular Sarcoma.

Roberts[110] finds that many of the cases of this disease in the vertebrae, hip, and knee are treated as tuberculous, and that they show symptoms of spinal cord disease rather than the pressure effects in weight bearing. Roberts thinks the x-ray is most important, says that the pain, local tenderness, and deformity often determine the diagnosis. Treatment by fixation does not relieve the symptoms. Roberts' article gives information in the way of differentiating this rather rare condition from the more common diseases of the bones.

Multiple Cartilaginous Exostosis.

After citing a case that he observed, Ehrenfried[111] draws a few conclusions in regard to this disease, which he considers as distinctly hereditary; if not hereditary, at least the author believes that it is congenital, and prefers to consider these cases as a type of deforming chondrodysplasia. The disease is characterized by the occurrence of multiple more or less symmetrical cartilage and osteocartilage growths, which are generally benign, and result from a

disturbance in the proliferation of the bone-forming cartilage. Certain typical secondary deformities of the skeleton occur. The hyperostoses as a rule affect the ends of the diaphysis close to the epiphyseal line. Ehrenfried recognizes that true exostoses occur in other regions. In fact, he tries to find in all these cases of multiple cartilaginous exostoses a distinct relation to the chondrodystrophic type of dwarf, with its short limbs and long body, though he classes the disease with rickets, acromegaly, and osteogenesis imperfecta, which are distinctly conditions of faulty bone and glandular metabolism. He believes the lesions are due to a faulty "anlage" for the bone producing intermediary cartilage.

Anteversion of the Femoral Neck in the Normal Femur.

Durham[112] has made a study of the anteversion of the neck of the femur in the normal individual and of its variations, which must be of importance when we consider cases of congenital dislocation of the hip. In studying 200 apparently normal, anatomic specimens, the femur was laid on a flat surface, with both condyles and one of the trochanters touching, while the angle of the axis of the femoral neck with the table was carefully measured. The average anteversion was 12.° Forty per cent. of the cases showed between 2° to 10° of anteversion; another 40% from 10° to 20° anteversion. The extreme anteversion was 35,° but in only two cases was it anywhere near this, and probably any condition beyond the limits of 5° to 20° of anteversion may be considered out of the normal.

Intermittent Claudication.

Bianchi[113] describes in detail a case of intermittent claudication or angina cruris, in which the condition seemed due not to any change in the peripheral blood vessels nor in the blood vessels of the spinal cord or medulla, but rather to a change in the circulation in the brain. There were repeated attacks induced by muscular exertion of some sort. These attacks were finally much improved by treatment directed toward improving the general circulation.

The Mechanics of Nerves.

By clinical experience and by experiments on monkeys, Stoffel[114] has found out that the appearance, course, and tension of the internal and external popliteal nerves are quite different, when the knee joint is in flexion and in extension. In the flexed position the nerve appears relaxed, wavy, and shows transverse and oblique wide stripes. If the nerve is cut there will be no gap at all, or only a small gap, if the joint is flexed, but a large one if it is extended. For the treatment of nerve injuries, Stoffel has worked out the most appropriate position for all of the large joints, as follows: For the brachial plexus and for the large nerve trunks in the axilla, adduction of the humerus; for the median and ulnar nerves along the humerus, acute flexion of the elbow and adduction of the upper arm; for the ulnar nerve where it passes the elbow, extension of that joint and adduction of the humerus; for the median at the forearm, right angle flexion of the elbow, supination and flexion of the wrist; for the ulnar, extension of the elbow, supination and flexion of the wrist. For the radial right angle flexion of the elbow, supination and maximum dorsal flexion of the wrist. For the sciatic nerve extension of the thigh, and if the injury is on the back of the thigh, flexion of the knee joint and plantar flexion of the foot. For the femoral nerve flexion of the thigh. After three to four weeks the nerves are so firmly united that the extremity can then be brought into a more natural position, thus preventing contractures.

The Intervertebral Foramen.

In a small volume of 100 pages Harold Sanberg[115] makes a unique study of this foramen in man, using the smaller serial sections from the cat to better demonstrate the anatomy. A study of his work will help to determine whether compression of the nerve is likely to occur at this point. The spinal nerves as they pass out thorugh the intervertebral foramina are almost completely surrounded by fat cells. Outside of the foramen the nerves come more closely in contact with the fibrous tissues; as the nerves divide into anterior and posterior divisions they become more completely surrounded by fibrous tissue. This tissue is also attached to the two adjacent transverse processes. The nerves pass immediately inferior to the transverse process of the upper vertebra and are very close to it. It is remarkable how little fat tissue there is about the nerve after it leaves the spinal canal. External to the intervertebral foramina little fat is to be seen around the nerves, and the increase of fibrous tissue in the microscopical sections is very noticeable. In cross section the spinal nerve appears to be less than one-third the size of the foramen. Atrophy of the intervertebral discs would reduce the size of the foramen, but not enough to cause pressure on the nerve. In thinning of the cartilages on the articular processes, the foramen is actually increased, by a lengthening of the antero-posterior diameter. "Possibly, in some cases of ankylosis, the nerve may be subjected to bony pressure, but this is very rare." Both in the spinal canal and the bony intervertebral foramina the nerve is well protected by a thick surrounding layer of fatty tissue. The author thinks it rare and only in extreme bony overgrowths that pressure on the nerve occurs there.

Biesalski,[116] who has taken over the editorship of the *Zeitschrift für orthopadische Chirurgie*, announces in the introduction the methods by which he proposes to conduct this important orthopædic journal. He plans to devote some space to the history and development of orthopædic surgery, because he believes that a great many methods, which are constantly invented only to be forgotten very soon, would be worked out more thoroughly before publication if the au-

thors had had knowledge of work which had already been done along these lines. The history of orthopædic surgery will be covered by monographs on certain subjects and by biographical sketches of important orthopædic surgeons. It is planned further to extend the exchanges of orthopædic papers with other countries. Biesalski emphasizes the prime importance of physiological and anatomical as well as clinical and experimental research. Finally social questions, the necessity of orthopædic teaching, progress in the care of cripples, and other significant problems are to be considered. Besides the already very highly developed abstract department, collective reviews are planned. Furthermore, it is announced that a new edition of Hoffa's text-book of orthopædic surgery is to be prepared by Gocht and Blenke, who also intend to renew the "Hoffa-Blencke" catalogue of orthopædic literature.

An evidence of the progress of orthopædic surgery is the new form of publication begun in January, 1916, by the *American Journal of Orthopædic Surgery*. A monthly journal has replaced a quarterly, and its scope is expected to be widened by original contributions bearing on orthopædic surgery from well-known general surgeons and by an increase in the number of abstracts and their more timely publication. It remains to be seen whether the American medical public is ready to help support such an endeavor, which is financed largely by the American Orthopædic Association.

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Reports of Societies.

THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

MEETING OF WEDNESDAY, OCTOBER 6, 1915, AT 8 P.M.

The President, DR. JAMES C. WILSON, in the Chair.

SOME APPLICATIONS OF PHYSICAL CHEMISTRY TO PROBLEMS IN MEDICINE.

DR. HENRY LEFFMANN: Under the term, physical chemistry, a vast and intricate science of molecular conditions and transformations has grown up, and has begun to throw light in many directions upon the problems presented by both living and non-living matter. It is my purpose in this paper to set forth in a plain manner a few of the data of physical chemistry that bear directly upon practical medicine. The science is abstruse and the facts can be treated only in an elementary way. I select for the purposes of the paper two phenomena, "ionization" and the "colloidal state." The phenomena of ionization are concerned especially with the condition ordinarily called solution, the latter term being here limited to fluids produced by association of substances, one of which is primarily a liquid. The term solution has a much wider significance in physical chemistry, common glass being considered a solution, but I will not apply this broad meaning in this paper.

Until a few decades ago the liquids obtained in dissolving common sugar and common salt in water were designated "solutions." It is now known that the activity of the salt has been materially increased, while the sugar has suffered no such change. The sodium atoms of the salt have by the act of solution acquired a positive electrical charge, while the chlorin atoms have acquired a negative charge. The proportion of salt thus modified is dependent largely upon the mass of water present. The modification of a substance by which it acquires these electrical charges is termed ionization; the respectively positively and negatively charged elements are termed "ions." The importance of the change lies in the fact that the chemical activity of the substance and the pressure of the solution are much enhanced by it. It is found that the most potent ionizing liquid is water. Generally the degree of ionization is increased by dilution. Interesting explanation of well-known phenomena are now possible under these principles. Boric acid is of the same type as nitric acid, yet is far less active. The difference is due to the fact that boric acid is but feebly ionized, while nitric acid is largely ionized. This applies also in the dilution of concentrated acetic and sulphuric acids.

The application of the data of ionization to the interpretation of the action of medicines is complicated by the fact that living protoplasm and membranes have specific selective powers, and thus tests *in vitro* may mislead. For example: Under given conditions, mercuric nitrate ionizes to a much greater extent than mercuric chlorid, yet the latter is ordinarily more toxic. According to Höber this is due to the fact that the chloride is more soluble in the lipoid substances contained in the membranes, and thus is enabled to get into contact with the protoplasm of the cells. Another important point is the influence of salts upon one another. It is far from being generally true that when a mixture of two or more substances shows no appreciable change of condition, such mixtures will have the properties of all the ingredients. An instance is that a mixture of mercuric chloride and hydrocyanic acid is not equivalent to mercuric cyanide, because the substances react in a different manner to the dissolving fluid. Inasmuch, however, as other solvents than water act but feebly in ionizing, it is not unlikely that an alcoholic solution of mercuric chloride and hydrocyanic acid would have a closer equivalency to mercuric cyanide than a solution in water. The cyanides afford several striking instances of the anomalous effects of mixtures. These data would seem to point to the importance of simplification in prescriptions. The files of any drug store will show most extraordinary mixtures, violating the simple principles of pharmaceutical chemistry. Might not the method of the homeopathic school of administering several potent substances at intervals be commended to the regular school of chemistry? The phenomena of reaction of salts to the solvent and to each other when associated in solution have important applications to the so-called "mineral waters," and no class of waters shows more untrustworthiness in these respects than the so-called "lithia waters." Another point brought into prominence by the progress of physical chemistry is the influence of extremely fine division. Ultramicroscopy has been developed of late years, dealing with the methods of rendering visible particles quite undetectable by ordinary microscopes. It follows from a consideration of this phase that by dividing a material finely we greatly increase the facility of chemical action. We also confer among other qualities constant self-agitation and easier passage through porous partitions. Medicines that are insoluble or difficultly soluble in the fluids of the body should be administered in as fine powder as possible, and here again we have to give reason to the homeopathic school. Manufacturing chemists do not always apply the highest principles of physical chemistry in their processes, and hence we sometimes find in drug stores preparations of distinctly inferior quality.

The physical chemistry of colloids is now occupying a vast army of workers. The initiative in this field is due largely to an English chemist, Thomas Graham, who in 1861 published the results of experiments on diffusion through membranes, finding that when a mixture was made of two substances, one of which was crystallizable and the other not, the former would pass rapidly through the membrane, while the other would be held back. He divided substances into two classes, "crystalloids" and "colloids." A solution of gelatin and common salt in water exemplifies both types. It is now known that a classification of substances into crystalloid and colloid is not fundamental. These are conditions only, and the same substance may assume both states. The crystalline condition probably results when molecular attractions are allowed more opportunity of acting; the colloidal condition results when less opportunity is afforded. Hence we find that crystals are produced by the solidification of a substance from a liquid or gaseous state. Also, the presence of a minute amount of a crystal of the substance in solution will materially promote the separation in crystalline form, acting as a nucleus for the operation of the molecular forces. Whatever may be the effect of uric acid when in the blood or deposited in the tissues, it is a serious interference

when separated in the crystalline form from the urine. Experiments made under the supervision of Dr. Martha Tracy at the Woman's Medical College of Pennsylvania indicate that a full meat diet increases the acidity of the urine. If this is established it will be an important point, for the principal danger from uric acid is in its separation in the crystalline form in some part of the genito-urinary tract. Such separation is promoted by increased acidity, and if a minute crystal is deposited at any point it will act as a nucleus, bringing about further separation of uric acid and of other compounds held in unstable solution in the urine. The administration of alkalies for the prevention of this separation may lead to the precipitation of substances not soluble in alkaline urine. It is obvious, therefore, how a full meat diet may cause or aggravate uric acid troubles, although not increasing the output of the acid itself. Knowledge of the nature and properties of colloids enables us to explain many physiological and pathological phenomena. Intimately connected with this field of chemistry is the subject of enzymes. These probably form the connecting link of living with non-living matter. They show colloidal properties and possess high powers of absorption. The problem of the cell is largely a problem of physical chemistry. Physical chemistry may be characterized by the description of politics which Mr. Pickwick gave to Count Smalkork: "A difficult study of no inconsiderable magnitude."

DISCUSSION.

DR. S. SOLIS COHEN: Dr. Leffmann's paper deals with a subject of such magnitude that a certain degree of temerity is required on the part of him who would approach it, not being a professional chemist. In so far as the physico-chemical reactions in the living body are the same as those of the laboratory, we may apply the laboratory findings to the problems of biology,—to physiology, to pathology, and to therapeutics. But as regards the great and increasing number of the outstanding biologic problems of the day, the value of the unknown factor, the x, or the x y z, is so great that we must hesitate. I think no stronger illustration of that can be given than the researches of Fischer upon edema and nephritis, and yet I do not know any clinician or pathologist who is willing to accept, without considerable reserve, Fischer's far-reaching conclusions. Fischer advocates the treatment of albuminuria, and of edema resulting from nephritis, by the introduction into the blood, of a concentrated (*i.e.* a *hyperhemotonic*) alkaline saline solution; and suggests one containing from 10 to 20 grams of crystallized sodium carbonate, and 10 to 30 grams of sodium chloride to the liter of water. This is from two to six times the concentration of the ordinary, so-called physiologic saline solutions. Fischer also rejects osmosis as an adequate explanation of cytolytic and similar phenomena, and opposes as unscientific, the common practice of restricting the intake of sodium chloride in conditions of edema associated with nephritis. Many striking instances of success by following his methods have been reported, also many failures. No analysis yet made has given data whereby the conditions determining the success or failure can be exactly estimated. Referring briefly to the phenomenon of ionization described in the paper, Wolfgang Pauli, in an interesting series of studies of the effects of various ions upon the living cell, investigated their comparative precipitating powers upon proteids and deduced the laws that: (1) The effect of a salt upon a protein is made up in the main of the algebraic sum of the effects of the individual ions: (2) that anions and kations antagonize each other. Pauli found that sodium sulphocyanide tended to reduce blood pressure and to prevent deposition of calcium in the arterial walls, so that it could be used with good clinical results in cases of arteriosclerosis. He found also that sulphocyanides were even more active than iodides in favoring the formation of readily soluble protein compounds with the heavy metals, and thus favoring elimination in cases of chronic poisoning. Other considerations enter into this problem, as into that of decalcification, but the whole subject comes under the head of ion-colloid reactions important to pathologist and therapeutist. In connection with the subject of sulphocyanide ions, however, the warning should be given that whereas sulphocyanide may be safely administered in doses up to 1 gram daily for sedative and analgesic as well as pressure-lowering effect, yet any compound of the sulphocyanide ion with an ester will produce almost instant death, owing to the solubility of the cell-lipoids in esters. Dr. Leffmann referred to the theory of narcosis by lipoid solvent substances, and this is a further illustration. In applying such studies as those of Dr. Fischer, it is important to bear in mind the modern definitions of acidity, alkalinity and neutrality. So in Pauli's experiments it seems strange to read that nitrate and acetate are ions inhibitive of precipitation, when we daily use nitric acid and acetic acid to precipitate albumin out of urine. But in acetic and nitric acids, we have, according to the modern view, hydrogen acetate, and hydrogen nitrate. Hydrogen is the kation, and if arranged in Pauli's series, should be placed as the strongest of all precipitants when ionized. Thus, too, we find acetic acid a more delicate test for albumin than nitric acid, because the acetate ion has less inhibiting power than the nitrate ion. So, at least, it seems to me. I should like to have Dr. Leffmann's view.

DR. ALFRED STENGEL: There is great reason that practical physicians should know something about the principles of physical chemistry and the newer principles of physics. The use of saline solutions is a method too often employed with the barest knowledge of the principles involved. The use of solutions of greater concentration than the solutions of the body will not bring about the desired results. The introduction of hypertonic solutions into the blood stream, as advised by some French clinicians, while carried out apparently without damage, is a questionable procedure. An argument in favor of physicians knowing something of the newer science is the principle of absorption in the combat against certain bacteria. This is demonstrated in the work of bacteriologists with Fuller's earth in the treatment of local infections, in which it has proven of unquestionable value in the matter of diphtheria and typhoid carriers. By the administration of Fuller's earth the bacteria have been removed in a way that chemical antiseptics are incapable of doing. Speculation arises in my mind whether or not the use of some of these insoluble substances may not act in the intestinal tract in this way. The work of Ehrlich comes closely upon the topic of physical chemistry. Investigators the world over are busying themselves with substances which in themselves harmless, in physico-chemical

combinations with tissues of the body or with bacteria rendered these elements innocuous.

DR. THOMAS MCCRAE: One danger to which many of us are exposed, not only in respect to the application of physical chemistry, but in other problems, is that of picking up terms without learning their meaning. This subject of physical chemistry lends itself to that. It is easy to talk about ions and ionization without having a clear idea of what is meant; of colloids and crystalloids, without having any clear conception of their meaning. In the paper everything discussed is made absolutely clear. Ionization has a tremendous bearing upon the bodily activities. Perhaps we are all familiar with the fact that ionization and electrolysis are closely connected. "Electrolysis puts life into the proteins." Dr. Stengel has referred to the use of hypertonic solutions. An interesting work is that done by Rogers in the giving of hypertonic solutions in the treatment of Asiatic cholera, in which his results justify the treatment.

DR. JOSEPH SAILER: The subject illustrates, first of all, the sympathetic quality of the medical profession in that it must take toll of all the sciences for the understanding of disease and the welfare of the human race. I agree with Dr. McCrae that we are prone to use terms with which we are not fundamentally familiar and apply them to therapeutics, believing that we are using physical chemistry when in reality we are working with something concerning which we know very little. Among many physical chemists, too, there is a great difference of view. Experiments of definite findings must not be too freely applied to living tissues since the physical chemistry of living tissue is not yet a very clear factor. The fundamental element in physics, in chemistry, and possibly the universe, is the atom, and it would seem that until we have a clear idea of the structure of the atom we could not go ahead in the solution of these problems. Until we have a clear conception of some of the problems of physics we are not at liberty to apply our methods with the idea that we are using a tremendous scientific advance in medicine. The application of definite facts of physical chemistry, however, is important, and, as in the use of the x-ray and all forms of radioactivity, must be carried out empirically before its value can be determined.

Harvard Medical School.

MEETING OF THE MEDICAL SOCIETY.

IN THE AMPHITHEATRE OF THE PETER BENT BRIGHAM HOSPITAL, APRIL 25, 1916.

Chairman, DR. HENRY A. CHRISTIAN, presiding.

Paper by DR. F. H. HEISE and MR. H. L. SAMPSON of Saranac Lake, New York.

Subject, "The Relation of the X-ray Findings to the Diagnosis of Pulmonary Tuberculosis."

DR. HEISE opened his talk with a few preliminary remarks regarding the types of lesions in pulmonary tuberculosis, together with their pathology, and what this pathology may be expected to show in the x-ray. He emphasized two classes of findings: (1) The nodular densities of linear form. (2) The mottling or non-linear type of density. He then took up the question of terminology as applied to x-ray findings in lungs, calling attention to the so-called "bronchial shadows" and the shadows due to actual tubercles.

For purposes of diagnosis two classes of x-rays of the chest are found useful: Group I, those which show bronchial and peri-bronchial densities. Group II, those which show "parenchymatous" densities. In regard to the latter group special attention should be placed on the irregular "mottling" and the "annular" densities. There is always greatly lessened transmission of light and the density may be very great even without fluid present. In Group I, actual tuberculosis is present only in a very low percentage of cases. In Group II, however, the percentage is very great. Of the cases in both groups associated with tubercle bacilli in the sputum, Group I showed a total of 6%, while Group II showed 94%.

The paper was accompanied by a demonstration of a large number of x-ray plates which illustrated the points in question.

DISCUSSION.

DR. VINCENT Y. BOWDITCH: Importance of x-ray in connection with clinical findings emphasized. Conservative attitude commended. Illustration of personal cases, calling attention to presence of density without clinical tuberculosis.

MR. H. L. SAMPSON: Emphasized the vague differences between actual "mottling" and linear nodules. Spoke of method of demonstrating cause of homogeneous character of shadow by splinting of opposite side.

DR. WALTER J. DODD: Group I,—the most puzzling problem which roentgenologists have to face. Age of patient very important. Increased density very significant in children. X-ray does not give positive diagnosis. Probable diagnosis much simpler in Group II.

DR. PERCY BROWN: Study of the lungs for pulmonary tuberculosis should begin in infancy and be carried on throughout life. Question should be, How early in life can we diagnose tuberculosis by x-ray? Differences between linear dotting and the findings in Group II not clear. Instead of calling shadows "tubercles," we should speak of them as "peri-tubercular processes." Fan-shaped distribution of mottling emphasized.

DR. FRANCIS H. WILLIAMS: The fluoroscopic examination, interpretation of plates and physical examination should all be done by the same person to get best results. X-ray should be a part of the physical examination.

DR. HEISE: In a series of 1,500 cases of hemoptysis with tubercle bacilli in sputum, the cause of death in 90% was pulmonary tuberculosis. When tubercle bacilli were not present, tuberculosis was cause of death in 70%. Question of correctness of term "tubercle" somewhat confused.

GILBERT HORRAX, *Secretary pro tem.*

IT has been demonstrated in Germany, France and England that the payment of a small cash allowance to nursing mothers helps to discourage bottle-feeding and diminishes infant mortality.

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ERNEST GREGORY, *Manager,*
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HARVARD MEDICAL AND DENTAL SCHOOLS. REPORTS OF THE PRESIDENT AND OF THE DEAN.

THE recently published annual report of President Lowell on the activities of Harvard University for the year 1914-15, refers in considerable detail as follows to the work of the Harvard Medical School in dispatching surgical units to the American Ambulance Hospital and to field hospitals in the British Army medical service. This description of the service of these units may be taken as the official statement of their intent and accomplishment.

"To the general public the most interesting event during the past year has been the work in military hospitals in Europe. Thanks to a gift by Mr. William Lindsay, it was enabled to take its turn among the leading medical schools of the United States in providing for three months, from April 1 to July 1, the surgical staff of the University service in the American Ambulance (Hospital) at Neuilly-sur-Seine. This first Harvard Unit, as it was called, went under the charge of Dr. Harvey Cushing as surgeon, and Dr. Robert B. Greenough as surgeon and executive officer, and comprised four operating-room nurses.

"Dr. Richard P. Strong, well known for his work on tropical diseases in the Philippines and in South America, and for his study of pneumonic plague in China, accompanied the unit as bacteriologist; but he had hardly arrived in Paris when he was called away to take the position of director of the American Red Cross Sanitary Commission to suppress the epidemic of typhus fever in Serbia. In an astonishingly short time the confidence of the Serbian authorities was won, the work organized, and, in spite of an almost total lack at the outset of the ordinary medical equipment for combating an epidemic, the disease was in a few months almost wholly suppressed.

"While the first unit was in France, a request came from the British Army Medical Service to a number of American universities for surgical units on a much larger scale—no less than thirty-two surgeons and seventy-five nurses apiece—to take charge for six months of field hospitals of one thousand beds. The University of Chicago sent a unit without delay. Representatives of Harvard, Columbia, and Johns Hopkins met, and being already somewhat depleted by surgical services in Europe, agreed to maintain between them a unit for six months. Harvard offered to take the first three months, and Dr. Edward H. Nichols undertook to recruit and lead the unit, with Mr. Herbert H. White as the business manager in charge of the preparations. These were, of course, difficult and exacting. In a very short time an efficient staff and nurses had to be enrolled; passports, transportation, instruments and supplies procured, and money raised—for although the English government furnished transportation and uniforms, with maintenance and daily pay at the usual army rates, several thousand dollars were needed for the instruments, for equipment and for the transportation of surgeons and their substitutes who could not remain the whole three months. The complete unit sailed on June 25, and was sent to a hospital in France under the command of Lieutenant-Colonel Sir Allan Perry.

"At the close of the three months it became evident to the British government that such a period was too short to justify the expense of transportation from America, and, therefore, the contingents from Columbia and Johns Hopkins did not go. But some members of the Harvard staff, with about half of the nurses, volunteered to stay on, and there arose a strong desire to renew the unit if needed. The money required was in part given, in part derived from the proceeds of a collection at the Harvard-Yale game; and a third Harvard unit was recruited, this time for six months. It sailed on November 14, with thirty new members of the staff and thirty-six more nurses, under the lead of Dr. David Cheever.

"The devotion of the surgeons and nurses, their willingness to do any work that fell to their lot, and their skill in treatment, has done us honor. It is gratifying to observe how few deaths and how few amputations occurred in either of the hospitals. By using to the fullest extent the resources of antiseptic surgery, almost all lives and limbs were saved. Above all, the work of our dentists—Dr. Potter at Neuilly, Dr. Kazanjian at the British hospital, and their colleagues—was a source of admiration. Their ingenuity in restoring jaws and teeth, apparently wholly destroyed, excited surprise and wonder abroad. Were it not that a prophet is not without honor save in his own country, it would be incomprehensible that the benevolent public here should leave with so little support a dental school which is doing such excellent work with wholly insufficient means."

President Lowell thus refers to the service and need of both the Medical and the Dental Schools. In the same volume of the official register of Harvard University appear also the special reports of the deans of the Faculty of Medicine, of the Medical School, the Graduate School of Medicine and the Dental School, with a section by Dr. Richard P. Strong on the work of the second academic year of the Harvard School of Tropical Medicine. It is impracticable at present to comment in detail on these special reports, but it is hoped that during succeeding weeks a series of editorials may be presented dealing singly with the work of certain departments of the Medical and Dental Schools.

MILK AND BABY HYGIENE ASSOCIATION.

THE seventh annual report of the Milk and Baby Hygiene Association for the year 1915 shows a gratifying increase in the work of that organization. The number of babies supervised during 1914 was 4,097; in 1915, 4,792. This is an increase of 250% since the year 1910, the first year of the Association. The report of the chairman of the board of trustees states that during the past year the Association has been able to save about 1200 babies. If we accept the figures of Professor Irving Fisher, that the economic value of a baby is $90, the reduction of infant mortality due to the efforts of the Association represents a saving to the city of $108,000. This has been achieved by the expenditure of $25,000.

The function of the Association is to keep well babies well. The three ways by which this is accomplished are, first, the encouragement of breast feeding; second, the provision of pure milk at cost for mothers unable to nurse their babies sufficiently or at all; third, the teaching to mothers by specially trained physicians and nurses not only proper feeding, but also proper infant care and hygiene. Twelve stations located in the more crowded and needy parts of the city have been established. Not only do the mothers bring their children to these stations for supervision, but from them nurses are sent out to demonstrate in the home proper methods of caring for the baby in other ways. It goes without saying that such instruction must exercise a beneficial effect upon the general conditions of homes and must be, therefore, an important influence in the preservation of health among those families reached by the Association.

The extension of the good work which can be done by this Association is directly dependent upon its financial support. The foundation of an endowment fund by a gift of $10,000 to the trustees in memory of Caroline Louise Moseley is but the beginning, it is hoped, of a financial strength which will enable the Association to extend its valuable services just as far as they may be needed.

"DENTAL HYGIENISTS."

MORE and more the importance of dental hygiene, particularly for school children, is being recognized. In a recent address at the Forsyth Dental Infirmary for Children, the director of that institution emphasized the dangers of poor teeth in school children both for themselves and for others. "All must share in the morbid pathological conditions of the neglected child, and this is particularly true concerning tooth and mouth conditions. The time is rapidly approaching when a child will not be allowed to enter a public school until he is physically fit." Even disease of the first teeth, which have been too often disregarded because of their transient nature, is capable of producing lasting effects upon the child. When the temporary teeth are lost prematurely, the permanent teeth erupt unassisted into various conditions of irregularity and malocclusion, which greatly interfere with the growth of bones of the head. Deformities of the nose and mouth may result, which interfere

with respiration and with voice production. Absorption from septic processes in the mouth has been much discussed of late.

Granting the truth of these facts does not settle the problem. The question of how to get so many thousands of mouths cared for, presents a number of difficulties. The interest recently aroused in dental hygiene has flooded the dentists with work. Many people cannot afford regular dentists' fees for cleaning, and the elementary part of the work, which is sufficient for the teeth of many children, should not require the time of a dentist.

Laws dealing with this situation have been enacted in Massachusetts and Connecticut, and now the Governor of New York State has recently signed a bill which provides for the training, registration and licensing of the "dental hygienist." The new law provides that any dental dispensary or infirmary, legally incorporated and maintaining a proper standard and equipment, may establish for women students a course of study in oral hygiene. One year's attendance at high school and one year's training in oral hygiene are required to become a licensed "dental hygienist." The person so licensed "may remove lime deposits, accretions, and stains from the exposed surface of the teeth, but shall not perform any other operation on the teeth or tissues of the mouth."

It is to be hoped that plenty of "dental hygienists" will be developed and that the portion of the public, who heretofore have been unable to afford dentists' services save for the worst toothaches, will appreciate the value of clean mouths and avail themselves of the opportunity.

A more detailed account of the need for such services and of the regulations which protect the public from their improper use will be found on page 697 of this issue of the JOURNAL.

A COURSE IN MILITARY MEDICINE.

THE attention of those interested from any point of view in military medicine is called to the announcement on page 696 of this issue of the JOURNAL of the course which will be given this summer at the Harvard Medical School. It would seem that such a course, apart from its practical value, would be most interesting. The JOURNAL takes this opportunity of presenting the prospectus for the consideration of its readers.

MEDICAL NOTES.

INFANTILE SCURVY AND PASTEURIZED MILK.—In the discussion of Dr. Funk's paper on "Vitamines; a New Factor in Nutrition," read before the New York Academy of Medicine recently, Dr. L. Emmett Holt expressed the opinion that infantile scurvy was undoubtedly on the increase in that city and that the increase was due to the exclusive use of pasteurized milk in the artificial feeding of infants. That this conclusion is probably correct is indicated by the interesting clinical observation reported by Dr. Alfred Hess at the same meeting. Hess found that a mild grade of scurvy developed in a group of infants artificially fed on pasteurized milk and barley water, while a control group to whose diet orange juice was added, but who otherwise received the same milk modifications as the first group, remained entirely free from scurvy. In the first group the scorbutic symptoms promptly disappeared on the administration of orange juice.

The New York Department of Health expresses itself as deeply interested in these papers and in the discussion which followed. The Health Department takes the position that these facts do not constitute an argument against the pasteurization of the milk supply, but that they should be considered as a warning against the temporary disabilities which may be produced by the exclusive use of pasteurized milk. The need of a supply of safe, raw milk (guaranteed or certified), which may be used by those cases in which pasteurized milk, even with the addition of anti-scorbutics, does not meet the requirements, is emphasized.

PHYSICIANS INVITED TO SPECIAL PEDIATRIC CLINICS DURING BABY WEEK.—In connection with the activities of the Mayor's Baby Week Committee in New York City, arrangements have been made for conducting a large number of pediatric clinics in the various child-caring institutions in that city. The list of clinics serves as an indication of the wealth of clinical instruction in pediatrics available in the city; the list is an imposing one and includes a large number of clinics by men of wide reputation. Laymen are not admitted, but all physicians are cordially welcome.

CRAIG COLONY FOR EPILEPTICS.—The twenty-second annual report of the Craig Colony for Epileptics records in extensive detail the work of that institution for the year ended October 1, 1915. There were 241 patients admitted during the year, making the total number of patients in the Hospital on September 30, 1915, 1,477. The report contains a considerable number of case reports, statistics of the patients, pathological reports illustrated with cuts, and concludes with a series of diagrams and charts used at the last State Conference of Charities and Corrections.

MODEL HOMES PLANNED FOR WASHINGTON.—Plans have just been completed for the erection of a series of model homes in Washington for the purpose of demonstrating to the nation the relationship between good housing and good health. These are to be known as the Ellen Wilson Homes and are not in the nature of an experiment, but are intended as a demonstration to the entire United States. This step is being taken with the desire to rid the Capital of the alley dwellings which have long been a matter of concern, both to health authorities and to public spirited citizens. The experience of Liverpool has shown that the building of dwellings with sufficient light, air and sanitary arrangements has decreased not only sickness and death, but also vice and crime. These changes have taken place in spite of the fact that the population living in the new dwellings is in some areas 99% the same as that which lived on the same area in the old buildings.

WORK OF THE NAVY MEDICAL CORPS.—In his address before the graduating class of the Navy Medical School on April 12, 1916, Rear Admiral William C. Braisted, Surgeon General of the Navy, reviewed the work of the present administration of the Navy Department in so far as it affected the medical corps of that service. The Secretary of the Navy has recommended to Congress the increase of the medical corps from 346 to nearly 500, and has made provision for the increase in the hospital corps of nearly 11,000 men. He has established two of the finest hospital corps training schools in the world for the training of male nurses, and has made provision for building a specially designed hospital ship. Schools have been established in Samoa and Guam for training the native women in nursing; and in Hayti, medical officers and nurses have been furnished to assist in the es- A naval medical reserve corps has been instituted and five Red Cross hospital units (mobile hospitals of 250 beds each) are now being organized.

STREET ACCIDENTS—A FREQUENT CAUSE OF DEATH.—According to statistics prepared by the New York Police Department, the total number of street accidents in New York City during 1915 was 22,540, of which 659 were fatal. Of the persons killed, 510 were male and 149 female, *i.e.* about three and a half times as many males as females; 106 were children under 6 years of age, and 184 were between the ages of 6 and 16.

In the non-fatal accidents the proportion of male and female was similar to that just noted, and there were 2301 children under 6 years and 5085 between the ages of 6 and 16 years.

As to causes, the largest contributors were the following, in the order of importance: passenger automobiles, 4865; electric street cars, 3028; falls, due to causes other than vehicular, 3005; horse-drawn vehicles, trucks or wagons, 2441; and collisions of all kinds, 2428. The other tablishment of sanitary conditions in the Island. causes of accidents are comparatively small.

It seemed of interest to discover, if possible, just what class of vehicle was responsible for the largest proportion of street accidents in New York City. Inasmuch as this detailed information is ordinarily not tabulated by the Police Department, a special tabulation was made of all street accidents, occurring in February, 1916, during which month there were 1407 accidents. Of these, 523 were caused by vehicles striking persons. In contradiction to the popular impression, only two of these accidents were caused by ambulances, one by a fire engine, three by omnibuses and five by mail wagons. According to the Police Department, this proportion of cases is typical of conditions generally, only a very small proportion of the street accidents in this city being due to the vehicles mentioned.

On the basis of the above figures, Dr. E. H. Lewinski-Corwin has computed that there was only one ambulance accident to every 5042 runs, and one fire engine accident to every 4491 runs. These figures speak eloquently for the general care employed by the drivers of these vehicles.

It may be of interest to see the distribution of accidents throughout the months of the year. The total number which occurred in New York City last year was 22,540. In January, 1580; February, 1359; March, 1725; April, 1953; May, 2041; June, 2118; July, 2291; August, 2071; September, 2126; October, 2084; November, 1648, and December, 1541. From these figures it is easily seen that during the summer months the frequency of accidents is greater than during the winter months.

BOSTON AND NEW ENGLAND.

MATERNITY INSURANCE.—In connection with the propaganda of infant hygiene now being carried on by the Mayor's Baby Week Committee, a determined effort is being made to arouse interest in maternity insurance as a powerful factor in the reduction of infant mortality. At the present time, hundreds of mothers who should be at home nursing their babies are forced, by economic pressure, to work in shops and factories, leaving their little ones, meantime, in the care of a neighbor or a day nursery. That means rising with the break of day, eating a hurried breakfast, perhaps nursing the baby at the breast, taking the infant to the day nursery and getting to the factory by eight o'clock. After at least eight hours of hard work, the tired mother must again take charge of her little one. Is there any wonder that the mortality among such infants is high?

With maternity insurance such conditions would be unknown: the mother would be sub-

sidized by the state to provide proper care for her child at home. Our present methods are palliative when they should be preventive. Certainly no more effective plan than maternity insurance can be devised to deal with this phase of infant mortality.

HOSPITAL BEQUESTS.—By the will of the late Mrs. Alice Joy Mason of Newton, Mass., the Boston Floating Hospital is the recipient of $1000.

The will of John W. Wheelwright of Boston, Mass., bequeaths to the Massachusetts Eye and Ear Infirmary the sum of $2000.

MEASLES IN BOSTON.—There has been reported a total of 259 cases of measles in Boston, an unusually large number at this time of year. The cases, however, have been mild and no deaths have resulted.

MASSACHUSETTS VETERINARIES' ASSOCIATION.—At the 32d annual meeting of the Massachusetts Veterinaries' Association the following officers were elected: president, Dr. Harry W. Pierce of Medford; first vice-president, Dr. W. H. Dodge of Leominster; second vice- president, Dr. W. M. Simpson of Malden; secretary-treasurer, Dr. E. A. Cahill of Lowell. Dr. Adolph Eichorn, chief of the pathological bureau of the United States Bureau of Animal Industry at Washington, gave an address on "Biological Therapeutics." Dr. F. M. Perry of Framingham, Mass., related experiences in shipping horses to the Allies.

MALDEN HOSPITAL NURSES' GRADUATION.—At the recent annual graduation exercises of the Malden Hospital Training School for Nurses seven diplomas were awarded. Miss E. M. Nichols, of the Boston City Hospital School for Nurses, delivered an address to the graduates.

SILENCE ZONES IN BOSTON.—Silence zones for hospitals accommodating fifty or more patients have been established by the City Council of Boston after a delay of months following the discovery that an ordinance previously reported to the committee was so worded as practically to prevent the playing of a piano anywhere in the Back Bay. The ordinance will go into effect June 1. It reads as follows: "The commissioner of public works shall, at the request of the authorities of a hospital, place and maintain a sign or signs displaying the words: 'Warning! Hospital! Make No Noise!' at such points as he may determine on public streets and places in the vicinity of hospitals accommodating more than 50 patients. No foot traveler, driver of vehicle, motorman of a street car, or operator of a motor vehicle shall make any unnecessary noise in the vicinity of such hospitals as to unreasonably disturb patients therein."

CONNECTICUT STATE MEDICAL SOCIETY.—The one hundred and twenty-fourth annual meeting of the Connecticut State Medical Society will be held at Hotel Stratfield, Bridgeport, Conn., on May 17 and 18th, 1916. The first meeting of the Council will be held at 9.30 A.M. on Wednesday, May 17, and the first meeting of the House of Delegates will be held at 10 A.M. Wednesday. All members of the Society are at liberty to attend the meetings of the House of Delegates.

On Wednesday at 2 P.M., the following program will be given: "The Prevention of Blindness in Infancy and Childhood," Eugene M. Blake, New Haven; "What Attitude Should the Physician Take Toward Sickness Insurance?" George Blumer, New Haven; "Onanistic Dyspepsia," Louis M. Gompertz, New Haven; "Results of Routine Study of the Placenta," J. Morris Slemons, New Haven; "Mental Defectives," Paul Waterman, Hartford.

Thursday morning, May 18th, 9.30 o'clock: "The Contribution of the Roentgen Ray to Gastrology," W. A. LaField, Bridgeport; "Lessons Learned from the Work of the Past Year," E. J. McKnight, Hartford; "Motion Picture and Lantern Slide Demonstration of Methods of Precision in the Treatment of Fractures," George W. Hawley, Bridgeport; "Motion Picture Demonstration. Operations: Bone Graft for Pott's Disease, Bone Graft Peg for Fracture Neck of Femur, Inlay Graft for Fracture of Long Bones, etc," Fred H. Albee, New York City, (by invitation).

Thursday afternoon, May 18th, 2.30 o'clock: President's address: "Some Defects and Inconsistencies in Connecticut Statutes and Medico-Legal Procedures," Max Mailhouse, New Haven; "The Clinical Study of the Respiration," David L. Edsall, Boston, Professor of Clinical Medicine, Harvard University; "Some of the Commoner Irregularities of the Heart," Charles W. Gardner, Bridgeport; "The Starvation Treatment of Diabetes," Walter R. Steiner, Hartford. The annual banquet will be held on Thursday evening, May 18.

THE WEEK'S DEATH RATE IN BOSTON.—During the week ending May 6, 1916, there were 268 deaths reported, with a rate of 18.38 per 1,000 papulation, as compared with 271 and a rate of 18.88 for the corresponding week of last year. There were 39 deaths under 1 year as compared with 52 last year, and 85 deaths over 60 years of age against 82 last year.

During the week the number of cases of principal reportable diseases were: Diphtheria, 64; scarlet fever, 68; measles, 201; whooping cough, 45; typhoid fever, 1; tuberculosis, 64.

Included in the above were the following cases

of non-residents: Diphtheria, 7; scarlet fever, 22; measles 1; whooping cough, 1.

Total deaths from these diseases were: Diphtheria, 4; scarlet fever, 2; whooping cough, 4; tuberculosis, 25.

Included in the above were the following deaths of non-residents: Diphtheria, 1; tuberculosis, 3.

EUROPEAN WAR NOTES.

WAR RELIEF FUNDS.—On May 6, the totals of the principal New England relief funds for the European War reached the following amounts:

Belgian Fund	$115,333.20
Serbian Fund	94,006.01
Allied Fund	93,331.36
French Wounded Fund	79,145.34
French Orphanage Fund	42,443.22
Armenian Fund	38,426.03
Surgical Dressings Fund	23,954.17
Italian Fund	17,179.86
Facial Hospital Fund	10,853.00
Artificial Limbs Fund	6,374.00

Obituary.

SAMUEL F. COUES, M.D.

DR. SAMUEL FRANKLIN COUES, second oldest living graduate of Harvard College, died May 1, 1916, at his home at 10 Mason Street, Cambridge. He was in his ninety-first year.

Dr. Coues was born in Portsmouth, N. H., in 1825. He was the son of the late Samuel E. Coues, a merchant of that town, and Clara Pierce, daughter of William Pierce of Gloucester. He was descended from Peter Coues, also a resident of Portsmouth, who was at one time sailing master in the British Navy of the noted ship of the line, the *Royal George*.

Dr. Coues was graduated from Harvard College in the class of 1845, and is survived by Dr. N. E. Soule, his classmate, and by William Henry Davison. Dr. Coues received his M.D. from the Jefferson Medical College in 1849, entered the United States Navy as an assistant surgeon on February 25, 1851, and was made medical director August 13, 1876, with which rank he was retired in September, 1887.

Dr. Coues made a three years' cruise around Cape Horn, on board the sloop of war *Portsmouth*, at that time the finest vessel of her class, both as to sailing qualities and armament, in any navy. He served all through the Civil War, either on board ship or in charge of naval hospitals. He married Mary B., daughter of George and Elizabeth E. Hughes of Boston. Since his retirement he had made his residence in Cambridge, and is survived by three sons, Dr. William Pierce Coues of Boston, Robert W. Coues of Cambridge and Franklin Coues.

Miscellany.

MILITARY MEDICINE AT HARVARD.

A COURSE of twenty-three lectures on Military Medicine will be offered in July and will be repeated in August. The hour of five in the afternoon has been chosen as most convenient for students who are pursuing other courses in the Graduate School. The lectures will be given daily, except Sundays, July 5 to 31 inclusive; and in August daily, except Saturdays and Sundays.

The main part of the course will consist of sixteen lectures by Major W. P. Chamberlain of the Medical Corps of the Army, Lecturer on Military Medicine, as follows:

SCHEDULE OF LECTURES BY MAJOR W. P. CHAMBERLAIN.

1. History of Military Medicine and Its Contributions to Science. Notable Work of Certain Military Surgeons.
2. The Medical Department of the United States Army. Duties Devolving on the Medical Department in Peace and in War.
3. Records of the Medical Department. Supplies for Medical Department. Methods of Obtaining and Accounting for Same. Samples of Medical Equipment to be Shown.
4. Examination of Recruits for the Army. Fundamental Importance of the Subject. Bearing on Pension Claims.
5. Military Sanitation in General. Housing, Feeding, Clothing and Equipping the Soldier.
6. Personal Hygiene. Hygiene of Hot and Cold Countries. Sanitation of Troop Ships and Troop Trains.
7. Principles of Marching. Hygiene of Marching Commands. Camp Sanitation.
8. Diseases Prevailing among Soldiers and their Prophylaxis. Important Bearing of these on Outcome of Campaigns.
9. Medico-Military Statistics. Bearing on them of Age, Length of Service, Arm of Service, Station and Race. Acclimatization in Tropics.
10. Military Weapons and the Character of the Wounds they Produce. Gas Poisoning.
11. Nature and General Treatment of Wounds in War. Difference between Civil and Military Practice and Reasons therefor.
12. Organization of the Army. Line. Staff. Sanitary Units in the Field. Ambulance Companies, Field Hospitals, Hospital Trains, Hospital Ships, etc.
13. Lines of Medical Aid on the Battle Field. Hospital Corps Drill. Evacuation of the Wounded. Importance of Prompt Evacuation.
14. Tactical Knowledge Needed by Medical Officers. Map Problems.
15. The Geneva and The Hague Conventions. The Red Cross Society.
16. Medico-Military Preparedness.

In addition, two lectures on "Military Sur-

gery in the Navy" will be given by a naval surgeon; four lectures on "Military Surgery in the European War," by members of the Harvard Units who have recently served abroad in the present war; and one lecture on the "Department of the Militia," by Surgeon-General Frank P. Williams of the Massachusetts Militia.

The object of the course is to acquaint physicians, as far as may be done by lectures, with the duties of a surgeon in the Army, so that they may be better prepared to assume such duties in case of emergency. The course will also be valuable for those who contemplate entering the Medical Reserve Corps of the Army.

The course is open to graduates in medicine and also to undergraduates of Class A medical schools.

The lectures will be given at the Harvard Medical School.

Fee, $10; for students registered in the Graduate School of Medicine, $5.

DENTAL HYGIENISTS.

BY EDWARD F. BROWN,

Secretary, Dental Group, Advisory Council, Committee on Child Hygiene, New York City Health Department.

A MONOGRAPH of the Department of Health of the City of New York states that it is safe to assume that not less than ninety per centum (832,500) of school children of the city are in need of dental treatment. It may be said that this situation is due to imperfect tooth structure, the causes of which lie partly, at least, in prenatal malhygiene, improper feeding of children, lack of cleansing, and neglect to prevent progressive decay by early professional treatment. The insidious character of tooth decay and disease is becoming increasingly apparent from the scientific relationships being drawn between oral malhygiene and disease. There are hardly enough licensed dentists to repair the dental ills of the school population alone. This situation, engaging the attention of school hygienists, has directed attention to new means of attacking this problem. It was apparent that little was to be expected from curative channels in any effective program of action. Prevention is the keynote of modern health work. Inasmuch as the prophylactic principles of dentistry are defined, it was patent that the solution lay in this direction.

For some time Dr. Alfred C. Fones of Bridgeport has been successfully experimenting in the use of so-called "dental hygienists," or specially trained women who give surface treatment to the teeth of school children.

Last spring Dr. Philip Van Ingen, chairman of the Committee on Child Hygiene of the Advisory Council of the Health Department of New York, in conference with the Health Commissioner appointed the following members of the advisory council of the department a committee to study, report and recommend as to the desirability of utilizing dental hygienists in New York: Dr. Herbert L. Wheeler, chairman, Dr. M. L. Rhein, Dr. Homer C. Groscup, Dr. Arthur H. Merritt, Dr. Henry C. Ferris, and Edward F. Brown of the Bureau of Welfare of School Children, Association for Improving the Condition of the Poor, as secretary.

The committee held a number of meetings, and on February 8, 1916, submitted the following unanimously:

"The sub-committee on dental hygienists held three meetings, at which time the question of dental hygienists was thoroughly discussed. The committee now begs leave respectfully to report that a trial of surface cleansing of teeth of school children, with accompanying instruction in oral hygiene, be commended at the earliest possible moment in one or more centers, preferably public schools, provided that the work be done by specially and adequately trained persons and under the supervision of competent directors."

On February 17, 1916, the whole Committee on Child Hygiene of the Advisory Council ratified the report and recommendations of the subcommittee.

Dr. Haven Emerson, Commissioner of Health, has evidenced the keenest interest in this work, and it appears probable that at an early date some nurses will be assigned to this work.

At one time there appeared to be some question as to the legality of employing dental hygienists. The question was submitted to the Corporation Counsel by the Health Commissioner, who reported that there is nothing in the dental law to prevent the use of dental hygienists.

In order, however, to avoid any possibility of untrained persons entering upon the work without proper legal safeguards to prevent fraud, inefficiency and exploitation, the legislature passed a bill (Senate Bill No. 391), which has just been signed by Governor Whitman, the provisions of which on this subject are as follows:

"Any dental dispensary or infirmary legally incorporated and registered by the regents, and maintaining a proper standard and equipment, may establish for women students a course of study in oral hygiene. All such students upon entrance shall present evidence of attendance of one year in high schools and may be graduated in one year as dental hygienists, upon complying with the preliminary requirements to examination by the board, which are:

"*a.* A fee of five dollars.

"*b.* Evidence that they are at least twenty years of age and of good moral character.

"*c.* That they have complied with and fulfilled the preliminary and professional requirements and the requirements of the statute.

"After having satisfactorily passed such examination, they shall be registered and licensed as dental hygienists by the regents under such rules as the regents shall prescribe.

"Any licensed dentist, public institution or school authorities may employ such licensed and registered dental hygienists. Such dental hygienists may remove lime deposits, accretions and stains from the exposed surfaces of the teeth, but shall not perform any other operation on the teeth or tissues of the mouth. They may operate in the office of any licensed dentist, or in any public institution or in the schools under the general direction or supervision of a licensed dentist, but nothing herein shall be construed as authorizing any dental hygienist performing any operation in the mouth without supervision. The regents may revoke the license of any licensed dentist who shall permit any dental hygienist operating under his supervision to perform any operation other than that permitted under the provisions of this section."

This law follows the enactment of similar ones in Massachusetts and Connecticut. With these progressive steps taken, it is to be hoped that through prevention we will preclude the possibility of another generation of children growing up, 90% of whom will be exposed to the havoc wrought by diseased and rotting teeth.

COMPULSORY HEALTH INSURANCE.

IN the issue of the JOURNAL for April 6 we commented editorially on the compulsory health insurance bill now pending before the Massachusetts General Court. A similar measure, known as the Mills' bill, has also been introduced before the New York General Assembly at Albany, and has been editorially commented on as follows in a recent issue of the *New York Tribune*. This comment appears pertinent as representing the attitude in another community towards the subject of compulsory health insurance.

"The theory of health insurance embodied in Senator Mills' bill is a legitimate and logical companion to that of payment for industrial accidents, which this state has already adopted. This bill provides for compulsory insurance for all manual laborers and others earning less than $100 a month. The cost is to be borne two-fifths by the worker, two-fifths by the employer, and one-fifth by the state. The benefits are medical and nursing attendance, a sick benefit payable after the fourth day of illness, continuing for twenty-six weeks, and a funeral benefit of not more than $50. The administration of the funds collected is to be by a joint association of employers and employees, according to trades, under state supervision.

"Such a proposal is essentially no more radical than that for compensation for industrial accidents. It has in its favor practically the same arguments as those to be made for the older and better known form of social insurance. Existing in some form in eleven European countries, health insurance has been pretty thoroughly tested and adjudged successful. Illness is an economic loss. It can be prevented to a considerable extent. This measure provides for a sharing of the burden of insurance costs by employers and workers, because both must cooperate to prevent illness; it provides for a state payment because disease means poverty, and the state inevitably bears a good part of the burden of poverty, in maintenance of clinics, hospitals and state institutions of various kinds.

"Experience under the workmen's compensation act has proved, once the employers were sharply urged thereto by the cost of the system, the possibility of checking the number of accidents by adoption of modern and scientific methods of operation. The result has been beneficial to them as well as to the employees, who found in the system a form of relief far more satisfactory than the old suit at law, with its ambulance-chasing lawyers, its delays, its uncertainties. These classes having benefited, the community at large also was better off.

"Inevitably that will be true through the establishment of health insurance. Campaigns for 'Health First' will spring up, as did those for 'Safety First.' Employers will learn that their business methods are susceptible of improvement to lessen sickness and disease among workers. That will mean greater working capacity, greater earning capacity for employees, and in time less drain on the public's charity, now the sole resource of the low paid worker, broken down and unable to care for himself."

Correspondence.

AN APPRECIATION.

BOSTON, MASS., March 25, 1916.

Mr. Editor:

With inexpressible edification I have just read, in the April number of the *American Magazine*, Dr. Richard C. Cabot's article on *better doctoring for less money*. The italicized words constitute the gripping title of this article and betray the writer's astute cognizance of the long-established fact that ours is a nation of shrewd-bargaining shopkeepers.

To avoid possible acrimonious controversy over the above characterization of our people, let me hasten to say that it is based entirely upon the appreciation of distinguished alien intellectuals, shocked at our amazing and incoercible cultural ineptitude. Leigh Hunt, for instance, as James Russell Lowell, in his delightful essay, "On a Certain Condescension in Foreigners," told us nearly half a century ago, could never think of America without seeing a gigantic counter stretched all along the seaboard. And, in very recent times, equally distinguished and sympathetic observers, some of English, others of Germanic origin, have made it unmistakably clear to us that, while culturally we are of the order of *osteocephali*, our ability to get the best of a trade is quite beyond dispute.

Curiously enough, in spite of this, our world-acknowledged perfection in sharp dealing, it remained for Dr. Cabot to bring home to us in his inimitable way, the startling fact that, for a regrettably long period of years, our laity have been stupidly oblivious to the fact that the self-same shrewd principles which have established their supremacy in wholesale dealing in rum, cotton, molasses and shoe strings, for example, are equally applicable—to their immense profit, withal—in their dealings with doctors of medicine.

The manner of Dr. Cabot's article is equally attractive with its matter and evidences a profound and sympathetic understanding of the shopkeeping American's fondness for the easily intelligible *argot* of commerce—*the stuff with the punch*. He tells us, among other things, that:

"A new era has come in the practice of medicine, but most people do not know it yet. We have begun to emerge from that stage of medical work in which the doctor was a peddler, selling goods from house to house, into the more advanced and sensible era in which the doctor stays at his place of business, like anyone else who has goods to sell, and the people who want those goods come to him. The shop where he has his goods to sell is generally called a hospital, and he has associated with him there a body of men and women similar to work people, foremen, and managers of any industrial plant or dry-goods store. He has there some beginnings of a satisfactory division of labor and specialization of function Therefore he can give the public a much better article for less money. The 'article' I refer to is sound medical advice and treatment."

In a similar vein Dr. Cabot goes on as follows:

"The patient who pays me a fee in my office would usually refuse to go to a free hospital on the ground that he is a self-respecting person and does not want to be treated like a pauper. On the other hand, he cannot possibly get the hospital grade of diagnosis and treatment by trotting around from specialist to specialist, because he cannot afford the ruinous expense attendant upon such a course. Hence, he has to be content, or discontent, with second-rate medical work. He has come to a cobbler to buy a pair of shoes, that is, to a man who makes the whole shoe himself, unaided. It is one hundred to one that he will get a poorer article and pay more for it than his friend who buys a factory-made shoe into the manufacture of which the skill of many has entered.

"The industry of the modern private doctor can be justly compared to that of the cobbler or the peddler. There he sits in his office and, like the cobbler, does a complicated piece of work with his own unaided hands; or he hurries from house to house like the peddler, and sells such goods as he can carry about alone. *Far too weak in his own brain and body* to carry about from house to house the resources of modern scientific medicine, he cannot pack into his grip an up-to-date x-ray machine, a selection of guinea pigs, rabbits, sheep or other animals which may be necessary for the performance of modern laboratory tests. It is really grotesque even to attempt a mental picture of the burden under which the family practitioner would stagger if he seriously undertook to give his patients the best that medical science today can provide, yes, can provide cheaply, too.

"By a curious combination of ignorance and misinterpretation, the general public today still believes that it is a luxury to be able to call a private physician to one's house, and a misfortune to go to a hospital as a patient. Exactly the opposite is the truth. Those who attend the best of our large public hospitals, free or for trifling fees, are really the aristocrats among patients. Those who call a physician to their houses or visit him at his office are the unfortunates, doomed to pay high for a relatively poor bit of service."

If any criticism is to be made of this contention of Dr. Cabot's with regard to the superiority of hospital treatment, it is to the effect that he is much too modest about it all. He should tell the public plainly that if the scene of the group workers' activities in a given case chances to be the out-patient department, the sufferer will there encounter much to cheer and delight him. He will, for example, find the "lounge" or waiting-room, with its green or dull gray walls simply adorned with a neatly-framed copy of the hospital rules and regulations, its warm cement floors and its settees of soft pine, a perfect marvel of restfulness; and that, if a stay in hospital is found necessary for the complete ministrations of the group workers, the patient is bound to sink with a sigh of comfort into his downy, stork-legged, white-enameled iron cot, in a charming cubicle with its "mission" easy chair, its Grands Rapids antique furniture and its priceless art-square floor covering, and there find surcease of worry in the lulling calm of a hospital atmosphere.

Under such conditions one can, if anywhere, really enjoy to the full the rapturous thrills which accompany spinal punctures, the blinding pleasure of ophthalmoscopic examinations, the languorous delight, leading almost to the point of faintness, which attends the taking of the blood-pressure and lays the foundation for the blood-pressure habit which everyone should acquire; and, finally, supreme of all joys —the x-ray examinations.

Dr. Cabot, in his article, lays repeated stress upon the paramount rôle played by the last-named procedure in establishing the indisputable superiority of the "goods" of the "shop, generally called a hospital" over those of "medical peddlers." And he is entirely right in so doing, for if the researches of the group-working specialists have left undiscovered a spot of disease in some inaccessible corner of the anatomy, the x-ray, with unerring penetration, is bound to reveal it, thereby adding materially to one's hopes of speedy recovery.

I dare not occupy more of the valuable space in your columns with further excerpts from Dr. Cabot's article, much as I would like to do so for the enlightenment of the profession at large. I do not hesitate to say, however, that, if any practitioner ventures to doubt the general superiority of the ideals and ethical standards of the new era of medical practice heralded by Dr. Cabot, he will alter his viewpoint after turning to the various prefatory notes to "Horae Subsecivae," by John Brown, M.D., LL.D., etc. There he will find a complete exposition of the absurd notions (now worn out and obsolete) which prevailed among the leading medical men of the mid-nineteenth century with regard to professional standards and practices.

From the above-mentioned prefatory notes I have made the following few selections. And, on second thought, it occurs to me that a critical study of them, fragmentary as they are, will doubtless serve to win the acclaim of the profession in its entirety for the practices and ethics of the new era that is upon us.

Let us note, first, the old-fogeyism of this passage:

"Our ordinary senses, our judgment and our law of duty, must make up the prime means of mastering and prosecuting with honor and success the medical, or indeed any other profession founded upon the common wants of mankind. Microscopes, plexímeters, the nice tests of a delicate chemistry, and all the transcendental apparatus of modern refinement, must always be more for the few than for the many. Therefore it is that I would insist more and more on immediate, exact, intense observation and *individual judament*, as the mainstays of practical medicine. From the strenuous, life-long, truth-loving exercise of these, let no amount of science, however exquisite, decoy the student: and let him who has them not greatly long after, as he will not greatly miss, these higher graces of the profession. What will make a

valuable physician or surgeon now, and enable him when he dies to bequeath some good thing to his fellow men, must, in the main, be the same as that which made Hippocrates and Sydenham, Baillie and Gregory, what we glory and rejoice to think they are."

The same stricture applies to this:

"Diagnosis has been greatly advanced by the external methods of auscultation, the microscope, chemical analysis, etc., and there is (I sometimes begin to fear we must say *was*) a better understanding of and trust in the great restorative powers of Nature. The recognition of blood poisons, and of many acute diseases, being in fact the burning out of long-slumbering mischief, the cleansing away of the perilous stuff manufactured within, or taken in from without, as seen in a fit of gout; in all this we have gained more than we have lost (we always lose something), *but is the practical power over disease commensurate with these enlargements? Is our sagacity up to our science?*"

Again to this:

"Sagacity, manual dexterity, cultivated and intelligent presence of mind, the *tactus eruditus*, a kind heart, and a conscience, these, if there at all, are always at hand, always inestimable; and if wanting, 'though I speak with the tongues of men and of angels, I am as sounding brass, or a tinkling cymbal; and though I understand all mysteries, and all knowledge, I am nothing. I can profit my patient and myself nothing."

Still further, to this:

"When the modern scientific methods first burst on our medical world, and especially when morbid anatomy in connection with physical signs (as distinguished from purely vital symptoms, an incomplete but convenient distinction), the stethoscope, microscope, etc., it, as a matter of course, became the rage to announce, with startling minuteness, what was the organic condition of the interior—as if a watchmaker would spend most of his own time and his workman's in debating on the beautiful ruins of his wheels, instead of teaching himself and them to keep the *totum quid* clean and going,—winding it up before it stopped. Renowned clinical professors would keep shivering, terrified, it might be dying, patients sitting up while they exhibited their powers in auscultation and plexiметry, etc., the poor students, honest fellows, standing by all the while and supposing this to be their chief end; and the same eager, admirable, and acute performer, after putting down everything in a book, might be seen moving on to the lecture room, where he told the same youths *what they would find on dissection*, with more of minuteness than accuracy, deepening their young wonder into awe, and begetting a rich emulation in all these arts of diagnosis,—while he forgot to order anything for the cure or relief of the disease!"

And, finally, to this:

".....I cannot help alluding to the crying and glaring sin of *publicity*, in medicine, as indeed in everything else. Every great epoch brings with it its own peculiar curse as well as blessing, and in religion, in medicine, in everything, even the most sacred and private, this sin of publicity nowadays most injuriously prevails. .....Besides the bad moral habit this engenders, it breaks up what is now too rare, the old feeling of a family doctor—there are now as few old household doctors as servants—the familiar, kindly, welcome face, which has presided through generations at births and deaths; the friend who bears about, and keeps sacred, deadly secrets which must be laid silent in the grave, and who knows the kind of stuff his stock is made of, their 'constitutions,'....."

It seems to me quite unnecessary to carry the comparison further. In closing I will say, however, that if, after the perusal of what I have written, there are still Thomases who doubt that the "medical goods" of the new era in medical practice are superior to those of the old, they will at least have the fairness to admit that these goods are cheaper.

Very truly yours,

J. W. COURTNEY, M.D.

EMPLOYERS' LIABILTY.

SOUTHBRIDGE, MASS., April 24, 1916.

Mr. Editor: It seems to me that a certain condition exists now in all of the towns and cities of Massachusetts, which ought to attract the attention of the medical profession, and also of the medical societies which are supposed to protect the interests of the members of the medical profession. The new laws which have been enacted, about employers' liability, have made the members of the corporations wise. They have hired, at a nominal sum, some nurse who is perhaps a registered nurse, but certainly not a registered physician, and that nurse does not only give first emergency treatment to patients injured, but continues for weeks to treat the patient, until some septic condition happens, and then she will turn the patient over to some privileged physician, whom the nurse likes or thinks perhaps the best man. It seems to me that our Massachusetts Medical Society, of which I have been a member for 18 years pretty near, ought to take means to protect its members and all of the worthy practising physicians. I hope this communication from me will be discussed, and some investigation made throughout the state. It is hard for a poor country doctor, who works day and night for a small pittance, to take up himself a thing of this kind; but a society like ours ought to be bound to take it up. I can prove what I assert right here in Southbridge, where in the American Optical Co., they have, and have had nurses who do more work in the surgical line than four-fifths of the physicians of this town. A few physicians, and I am not jealous of them, because I have as much as I want to do, are called once in a while, when amputation or serious major operations are required. Outside of that, everything is done by the nurse. I know of a case where a man employed by the American Optical Co., cut his finger in his own cellar and went to the nurse for treatment, until she was afraid of a septic condition and recommended some physician, but he came to me. These conditions, gentlemen, ought to be considered by our good and worthy society, and some quiet investigation made, and then some action be taken with the State Board of Registration. Hoping these few remarks will bring some results, I am, gentlemen,

Yours very truly,

JOSEPH G. E. PAGE, M.D.

TOO MUCH ASEPSIS.

CENTRAL FALLS, R. I., April 14, 1916.

Mr. Editor:—Apropos of the recent paper in your JOURNAL on "Too Many Caesarians," I am led to inquire whether there is not such a thing as too much asepsis in obstetrical practice. I am certainly coming rapidly to this belief.

During my interneship in one of our metropolitan lying-in hospitals, and since going into private practice, I have been comparing the results of practically perfect asepsis with those in cases where the asepsis has, for some reason or other, been poor.

In my hospital experience I remember that the greatest precautions for asepsis were taken, yet numerous cases ran an elevated temperature afterwards, indicating some grade of infection. Sterile gloves and

gowns, sterile sheets, instruments, bobbin, etc., were used, yet the patients would have temperatures running from 99° to 104°. Many times every chart in the hospital showed an increased temperature, with an elevated pulse; and a good many of the patients had ice-bags over the fundi.

The greatest aseptic care was taken in tying and cutting the cords. Sterile instruments were applied; sterile bobbin used; the hands were sterile; and a sterile bath was given to the baby. In spite of this, there were numerous cases of wet and septic stumps. On the other hand, in the out-patient department, where patients were delivered by externes under all sorts of conditions, where perfect asepsis was an impossibility, in these cases an elevated temperature was unheard of, and a septic cord so rare that the percentage was practically negligible.

I have observed practically the same results in private practice. My practice includes a large number of ignorant foreigners, to whom elaborate preparations for asepsis are extremely alarming. They absolutely refuse to be handled by an obstetrician wearing rubber gloves. A sterile gown reminds them of an autopsy. Cleansing the field of operation makes them angry, as they feel it implies uncleanliness on their part. If the physician persists in his preparations, the chances are that he will be discharged, and another called who is not so exacting. Under such conditions, I have seen and had many cases where, through no fault of mine, the asepsis was as bad as it could possibly be. Yet I have been surprised at the uniformly excellent results. In none of these cases have I ever seen a temperature over 99.5° or a pulse over 90. The only asepsis consisted in carefully scrubbing the hands, and sterilizing the instruments. Many of these cases were operative, such as low forceps without ether, or versions without ether, where the patients refused to take an anesthetic or to be scrubbed. Not one of them ran a temperature. In fact, most of the normal cases got up on the second to the fifth day, in spite of advice, warnings or threats. A wet or septic cord in the baby is so rare among these cases that I no longer give them any thought.

Now I should like some explanation for these facts. The only satisfactory answer I can see is that most patients are immune to the effects of their own bacteria. As soon as we go scrubbing, washing and cleaning, we introduce outside bacteria, which take hold and make trouble. The scrubbing process may also make minute lacerations, which enable an outside infection to gain a further foothold.

I am not by any means an advocate of no asepsis in obstetrics. I always use the greatest possible care in cases where I can, but when I see aseptically conducted cases become septic, and non-aseptic cases remain clean, my confidence wavers, and I sort of wonder whether it really is not being overdone.

Very truly yours,

LIONEL L. ALBERT, M.D.

CHANNING HOME.

BOSTON, MASS., May 1, 1916.

Mr. Editor: Through your correspondence column, may I make known a recent modification in the entrance requirements for female patients at the Channing Home, as follows:

In accordance with a vote of the Board of Directors, it will now be possible to admit a limited number of pulmonary cases for investigation.

This provision is intended to meet the need for an accessible place within a medical centre to which patients of limited means with obscure pulmonary conditions, especially those suspected of having pulmonary tuberculosis, can be sent for a period of observation and study in order, if possible, to establish the diagnosis.

The funds of the Home do not suffice to cover the full cost of maintenance, and a charge of five dollars per week is made for board with an additional charge of about three dollars for x-ray examination when this is necessary.

Physicians may make application for the admission of patients for diagnosis by letter or telephone to the Home. Physicians who send patients to the Home will be notified of the results of the investigation.

Very truly yours,

FREDERICK T. LORD, M.D.

DRUG PATIENTS IN WESTBORO STATE HOSPITAL.

WESTBORO, MASS., April 27, 1916.

Mr. Editor: From October 1, 1914, to October 1, 1915, the Westboro State Hospital treated sixty-nine drug patients and fifty-five habitual drunkards. (Our hospital year begins October 1st.) There were forty-three women who had a positive Wassermann among the drug users and twenty-three among the inebriates. More than half of the whole number of women of this type admitted had syphilis in the last few years. Working with them every day I have learned facts not given in their hospital histories, and I feel that the public ought to be warned against a most dangerous evil; for most of these women either worked as waitresses, or came in contact with food served to the public while under treatment for syphilis.

A few cases taken at random:

One woman told me she was employed in the kitchen of one of the Boston hotels at the time she contracted syphilis from a meat cutter. (This man worked in one of the large markets.) Two attractive young women were nurse-girls in the Back Bay while being treated. Another woman was a cook for a well-known family in Salem.

Two women worked in the alteration department of one of our large stores. Still another laughingly told me that she was demonstrating a pure food product over the country.

A clean looking woman of thirty did laundry work in a wealthy physician's home on Beacon Street.

Three good looking narcotics worked in a candy store.

Two girls dispensed soda water at a beach resort, and so on, and so on. Most of these women gave a fictitious name, address, and kind of work they were doing, at the dispensaries where they were treated for syphilis. Even here at this hospital a number were under assumed names.

Don't you think it would be a good idea to have a law passed compelling everyone, who handles food in a public place, to show a clean bill of health before being hired?

Very truly yours,

ALICE S. CUTLER, M.D.

CAESAREAN SECTION AGAIN.

BOSTON, MASS., April 21, 1916.

Mr. Editor: Dr. Williams' recent rejoinder to my paper on Caesarean Section forces me to ask space for a few defensive comments.

First.—Reading my paper through to find what is in it, I am unable to agree that I have taken the position that operative labor has no maternal mortality. I can find nothing in the paper about this, and am ready to accept Dr. Williams' statistics on the subject. Neither did I object to Caesarean Section as an alternative to high operative delivery; I rather approve of it. I simply suggest that an effort be made to determine in advance that high operative delivery will be necessary. One's judgment will sometimes be in error both ways. One's choice of primary Cae-

sarean section or true test of labor in cases with persistent high head, which cannot be put into the pelvis, but overrides little or not at all, will depend on the obstetrician's temperament; either way is honest, fair obstetrics in a primipara. Cases which override definitely will, of course, have Caesarean. I covered these two conditions in my general comment on fair indications under the head of relative pelvic and fetal disproportion.

Second.—Regarding Caesarean for Primiparous Breeches I have never had the pleasure of seeing Dr. Williams' paper in which he shows that a breech presentation usually means lack of accommodation between fetus and pelvic inlet, or uterine cavity, but in view of the fact that it is still a moot point obscured by theoretical discussion what determines even the normal presentation and in view of the fact that many multiparous breeches occur in normal pelves after previous vertex presentations, and that many primiparous breeches occur in which there is no obvious disproportion, and in view of the fact that many primiparous breeches are lost, not for pelvic reasons, but because the cervix dilates badly on the whole, and bags are not used to complete the dilatation, lost in other words by the not fully dilated cervix shutting down on the after-coming head or from one or another cause, not due to bony pelvis, spoken of in my original paper—in view of these facts, I must agree with Dr. Williams in his rejoinder, rather than what seemed to be his opinion in his original paper, *i.e.* that "one should try to determine in advance of labor which of the primiparous breech cases are going to fall within the 10% in which the baby is likely to be lost, and perform Caesarean section." This was exactly my contention; not that Caesarean section should be performed for primiparous breech cases as routine unless the baby is obviously small.

Third.—With regard to one Caesarean necessitating another: (1) I am unhappy to have to state that I have always been unable, try as I would, to see what bearing experimental work on *cats' uteri* had on the *uteri* of pregnant *women* who had been subjected to Caesarean. (2) It has been shown by clinical experience that one cannot tell what goes on under a belly wall after it is closed tight. The uterus is a contractile organ; it is possible for a stitch to split out without sepsis. It is also possible for stitch abscess to occur without more general symptoms than are attributed to "absorbing blood clot," or low grade intra-uterine sepsis, or low grade puerperal tube infection—either gonorrheal or not. (3) Good opinion based on clinical experience is overwhelmingly against Dr. Williams in this matter. (4) Because individual cases get by with delivery from below after Caesarean is less than no argument. Very many will get by, but occasionally one will rupture.

Fourth.—If a woman has lacerations from below most of them are capable of repair by not difficult surgery. If she has trouble in the abdomen following Caesarean, surgery is usually useless, oftentimes harmful.

Fifth.—I do not think much of pubiotomy in infected cases either, but as an alternative for craniotomy on the living child I consider it safer within its limitations than Caesarean. If one is bound to have sepsis, it pays to keep it in the pelvis and out of the abdomen; while Porro-Caesarean on a patient in shock from long labor is a formidable proposition. Each, of course, has its place. Simple Caesarean on a septic case has no place at all.

Finally.—The subject of intracranial hemorrhage is not yet a clear one; it occurs in normal deliveries and easy low forceps as well as in difficult high deliveries. Having ruled out high forceps in favor of Caesarean under head of relative pelvic and fetal disproportions in my paper, as above pointed out, I fail to see the point of this comment here.

In conclusion it seems to me Dr. Williams has missed the whole point of my paper: it is a plea for Caesarean section in its place as well as against its indiscriminate use; it does ask for individualization of cases, more individualization along rational lines than reported series of cases show is being given. But above all it remains a protest against the idea illustrated by the happy young woman who has had one live forceps baby who announces cheerfully at four months, "Oh, I'm going to have a surgeon this time for my baby, and no pain; I'm going to have a Caesarean."

Very respectfully yours,
FOSTER KELLOGG, M.D.

SOCIETY NOTICE.

NEW HAMPSHIRE MEDICAL SOCIETY.—The one hundred and twenty-fifth annual meeting of the New Hampshire Medical Society will be held at Concord, N. H., on Tuesday, May 16. The House of Delegates will meet the previous evening at the Eagle Hotel, Concord.

The meeting will open at 10 o'clock. At 11 o'clock the section on medicine and the section on surgery will meet simultaneously for the presentation of the program. Dr. Phillip H. Greeley is chairman of the section on medicine, and the program will be as follows:

"Diphtheria with Observations on a Recent Epidemic," by Dr. Arthur V. Doud, Bristol; "The Relations of the General Practitioner to the State Hospital," by Dr. Charles H. Dolloff, Concord; "Medical Registration—Its Progress and Its Prospects," by Dr. Walter T. Crosby, Manchester, Secretary N. H. State Medical Board; "The Modern Tonsillectomy," by Dr. Edward R. B. McGee, Berlin.

The section on surgery, of which Dr. Ferdinand A. Stillings is chairman, will present the following papers:

"Colica Mucosa," by Dr. John G. W. Knowlton; "The Operative Treatment of Fractures," by Dr. Percy Bartlett; "The Co-Efficient of Safety in Surgical Operations," by Dr. Herbert L. Smith, and "Brain Tumors," by Dr. Freeman A. Tower. A general session will be held at 2 o'clock at which the following papers will be read.

"Peri-Rectal Suppuration and Sequelae," by Dr. Ralph W. Jackson, Fall River, Mass.; "The Treatment of Un-United Fractures," by Dr. Edward Hall Nichols, Boston; "Obstetric Advances Including Anaesthesia—The Use and Abuse of Pituitrin—Extra-Peritoneal Caesarean Section—Pubiotomy and the Significance of Funnel Pelves," by Dr. John Osborn Polak, Brooklyn, N. Y.; "Pneumonia in Children," by Dr. John Lovett Morse, Boston.

RECENT DEATHS.

DR. WILLIAM STANFORD STEVENS died at his home in Boston, April 29, aged 56. He was a graduate of Harvard College in the class of 1880, and of the Harvard Medical School in 1883. He was at one time a member of the Legislature and of the Boston Common Council. In 1895 he moved to St. Albans, Vt., returning to Boston in 1913. Of late years he had devoted himself to business affairs. He is survived by his widow and two sons. He was a Fellow of The Massachusetts Medical Society.

DR. JOHN EARLE KENNEY, a Fellow of The Massachusetts Medical Society, died at his home in Chelsea, Mass., May 3, aged 54 years. He was a graduate of the University of Vermont College of Medicine in 1882, and joined The Massachusetts Medical Society in 1884, from Winchendon. He moved to Keene, N. H., in 1896, and had practised in Chelsea for the last fourteen years.